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DISEASES
of the
MALE URETHRA
INCLUDING IMPOTENCE AND STERILITY

BY

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1918

AFFECTIONATELY DEDICATED

TO MY SON

JOHN M. W. KOLL

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FOREWORD

In my capacity as teacher of both undergraduate and post-graduate students I have long felt the need for a comprehensive monograph on Diseases of the Male Urethra, including Sexual Impotence and Sterility.

My efforts have been directed toward conciseness, clearness, and simplicity. The clarity of the subject is greatly assisted by the many illustrations, nearly all of which are original and taken from my clinic at the Post-Graduate Medical School.

Some of my views, I realize full well, are reactionary and may not be shared by some of my colleagues, but the work represents my personal experience, except in so far as I make quotation, particularly in the Biologic Chemistry of the Gonococcus and the Studies on Spermatogenesis.

I wish to make public acknowledgment of the untiring and fruitful efforts of my artist, Dr. Dan Z. Klopper, and the help given me by my assistant, Dr. Leon Seidler.

I. S. K.

May, 1918.

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DISEASES OF THE MALE URETHRA

CHAPTER I

ANATOMY OF THE URETHRA

THE urethra begins at the neck of the bladder, passes downward and forward, almost vertically, then gradually ascends to the level of the anterior border of the symphysis pubis. It again turns forward, taking the while for a few centimeters a gradually descending course, penetrating the scrotum. It then penetrates the penis, which it traverses along the inferior surface throughout most of its length. The urethra thus occupies successively the anterior part of the pelvic cavity, the anterior part of the inferior walls of the pelvis, called the urogenital diaphragm, the scrotum, and the penis (Fig. 1).

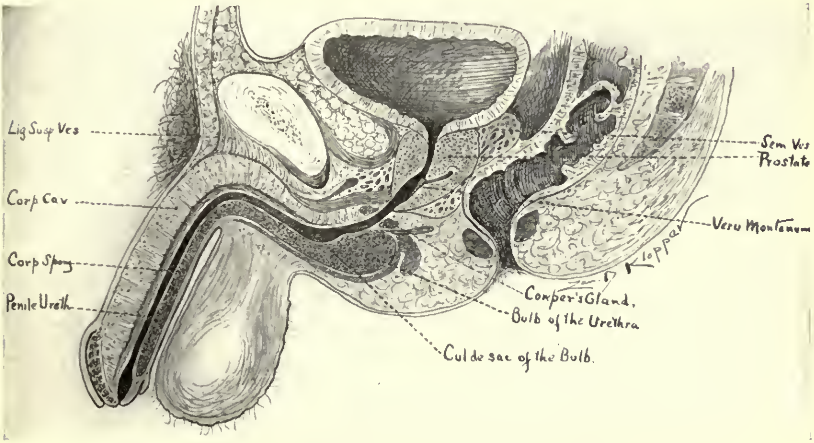


Fig. 1.—Sagittal section of the genital tract.

The careful consideration of its course and angles is of practical importance in the selection of sounds for the dilatation of strictures of the urethra.

The urethra may be divided into the pelvic, perineal, scrotal, and penile portions. The pelvic, perineal, and scrotal parts are relatively fixed. The penile part has the same mobility as the pendulous portion of the penis. We thus can distinguish between a fixed urethra (perineal and scrotal portions) and a mobile urethra (penile portion), this division being important from a surgical standpoint. Another classification divides the urethra into the prostatic, membranous, and pendulous parts. The prostatic and membranous parts are the fixed portions of the urethra. The anterior alone, or the pendulous portion, is mobile. The pendulous portion extends from the tip of the penis to the inferior surface of the perineum. The urethra is then composed of an anterior and posterior portion, the posterior consisting of the prostatic and membranous portions.

From a physiologic point of view the urethra from the neck of the bladder to the ejaculatory duct is truly urinary; from the opening of the ejaculatory duct to the meatus it is urogenital.

In its entirety the urethra always remains in an anteroposterior plane. It is concave anterosuperiorly. Arising from a part approaching the anterior surface of the symphysis the concavity increases and it goes to the inferior surface or free portion of the penis; this portion it joins at an angle. The urethra as a whole then has the form of a letter S. But of the two curves of the S, the posterior only is fixed. The anterior curve is easily changed. All that is necessary to obliterate this curve is to raise the penis toward the pubes. The urethra is very loosely attached to its neighboring structures. The prostatic portion is held in place by the puboprostatic ligaments.

The membranous urethra is attached behind by the central perineal tendon to the inferior fibers of the deep transverse fascia. The bulbous urethra is joined firmly to the layers of the ischiopubic fascia. The posterior part of the pendulous portion of the urethra is fixed by the suspensory ligament of the penis to the inferior surface of symphysis. It is this ligament which produces one of the angles of the urethra, but this angle is easily obliterated. In résumé then, we may say that there is no absolutely fixed point of the urethra, but one portion is more fixed than the rest. This region is more solidly joined to the neighboring portion and consists of the union of the membranous and pendulous portions.

Dimensions.—Sappey, who has taken a number of measurements of the length of the urethra, states that it varies from 15 to 17 cm., divided as follows:

Twelve centimeters for the pendulous urethra, 1.2 to 1.4 for the membranous, and 2.4 to 3 cm. for the prostatic. These measurements correspond closely to those given by other authorities.

Form and Diameter.—In the quiet or detumescent state the walls of the urethra are collapsed; during micturition, on account of the narrowness of the meatus and because of the force exerted by the vesical sphincter, the urethral walls expand. The urethra is then said to be in physiologic or normal distention. It is, of course, possible to stretch the urethra with instruments beyond its normal size. It is in this stretched condition that the surgical caliber of the urethra is measured.

Behind the meatus the urethra dilates into an ovoid, measuring between 20 and 25 mm. in length. This forms the navicular portion. Posterior to this the canal takes the form of a cylinder 6 to 7 cm. in length, extending to the penoscrotal junction. Here again there is a widening, ovoid in shape, extending into the culdesac of the bulb. The membranous and penile portions are cylindric.

The diameters given by Raybard and Guyon are as follows:

Fossa navicularis, 7 mm.
Meatus, 8 mm.
Bulbous, 10.3 mm.
Membranous, 8.6 mm.
Prostatic, 8 to 11 mm.

A median section through the entire urethra shows that the meatus, fossa navicularis, and penile portions are in the same axis; this is not true of the bulb, which joins below and behind the true culdesac (Fig. 1). This becomes continuous with the membranous portion. This culdesac develops at puberty and is present only during micturition; it becomes permanent in old age, probably because of the relaxed condition of the walls at this point. An instrument introduced into the urethra and passed straight back encroaches upon the wall of the culdesac and may not pass into the lumen of the urethra. Force exerted will cause the instrument to pass into the wall of the urethra, thus producing a false passage. This, too, may occur in the prostatic portion. Here, near the internal urethral arch, there is an overhanging lip made by the sphincter. The sound introduced incorrectly or brutally may easily produce a false passage.

These depressions or irregularities lie upon the posteroinferior wall. The anterosuperior walls run in a straight line. The tip of a sound should be made to follow along this line in order that it may enter the bladder unobstructed.

Form and Surgical Caliber.—The urethra is supple and can easily take on the form of the instrument introduced into its cavity. According to Otis, the diameter of the urethra can be raised artificially from 8.9 to 12.7 mm. In this proportion it would compare with the diameter of the penis as 1 : 2.25.

The narrowest point of the urethra is at the meatus; it permits of the least amount of dilatation. However, a No. 54 Benique, of which the diameter is 9 mm., may easily be introduced. The membranous urethra may be dilated up to 10 mm. The prostatic region may be enlarged to 2 cm. in diameter. Oberlander and Kollman give the following dimensions to which the urethra can be dilated:

Prostatic and membranous portions, 13 to 15 mm.; bulb, 16 to 17 mm.; the neck of the fossa navicularis, 8 to 10 mm. The capacity of the urethra varies in different individuals and also according to the method by which one distends it. This fact is of practical importance in connection with instillations. According to different investigators the capacity may be said to vary from 4 to 22 c.c.

The **prostatic urethra** (Figs. 2 and 3) is surrounded throughout its entire length by the prostate gland. In front the prostate separates the urethra from its sphincter, the anterior ligament of the bladder, the plexus of Santorini, and the symphysis pubis; laterally from the fascial layers of the prostate and the venous plexuses which they enclose, and further from the levator ani muscle; behind from the prostatoperitoneal fascia of Dénonvilliers. The openings of the ejaculatory ducts penetrate the lumen of the urethra through the posterior wall. Above, the prostatic urethra becomes continuous with the bladder; below, with the membranous urethra.

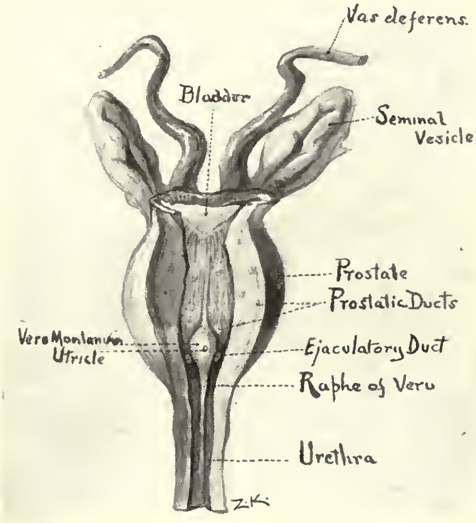


Fig. 2.—A dissection of the prostate and adnexæ.

The **membranous urethra** then is a continuation of the prostatic urethra. Below it joins the culdesac of the bulb. Behind, it is in close relation in its superior segment with the rectum, from which it is separated a trifle as it expands, the rectum going behind, the urethra forward. The space between these two structures forms the two sides of the recto-urethral triangle. This triangle contains a quantity of fatty connective tissue, fibers of the superficial perineal fascia, and a fibromuscular raphé joining the central perineal body.

Cowper's glands (Fig. 4) occupy the triangular space which surrounds the membranous urethra and the superior surface of the bulb.

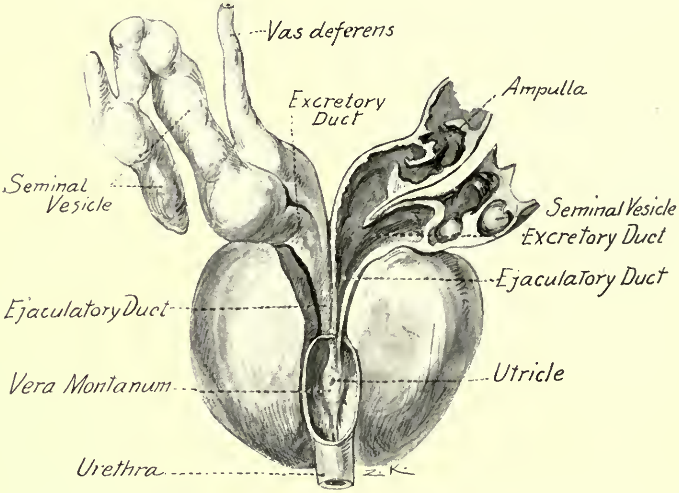


Fig. 3.—Showing the gross structure of the seminal vesicles.

This recto-urethral triangle is of surgical importance in reaching the membranous urethra, the prostate, and the neck of the bladder.

The **pendulous urethra** (Fig. 2) extends from the membranous portion to the meatus. It is divided into three parts: perineoscrotal, penile, and navicular.

The **perineoscrotal part** is in relation above with the transverse pelvic ligament and some fascia lamellæ which end at the point of union with the corpora cavernosa. This lamella separates the urethra from the dorsal nerve and vessels of the urethra and from the plexus of Santorini. On its posterior surface, running along the bulb a distance of about 2 cm., lie the ducts of Cowper's glands, which empty into the cavity of the urethra.

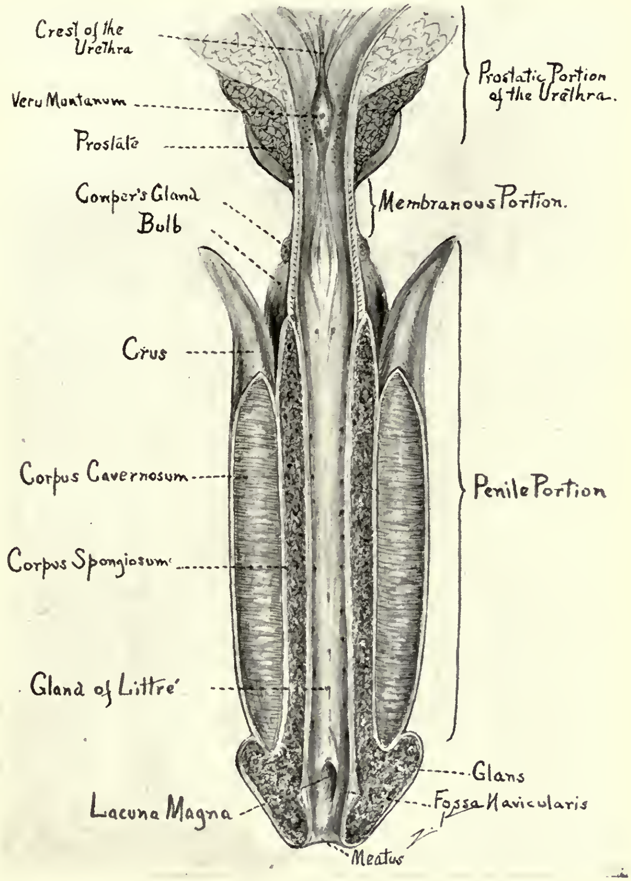


Fig. 4.—Sagittal section of the entire urethra and penis.

Penile Portion.—This part of the urethra is separated by its spongy sheet of fibro-elastic tissue from the circular muscle of the penis and from the skin.

The Navicular Portion.—This part of the canal extends from the level of the crest of the glans penis, the corona, to the meatus.

The Structure of the Urethra.—The mucous membrane extends from the vesical orifice to the meatus. It covers the canal throughout its length and acts as a smooth sphincter to the prostate, to the verumontanum (Fig. 3), to the membranous and pendulous urethra. It shrinks at the vesical neck, at the membranous urethra and meatus, at which level the urethral caliber is less. It widens at the prostatic sinus, the culdesac of the bulb, and the fossa navicularis. The utricle, a depression in the veru, and the openings of the ejaculatory ducts are covered with mucosa continuous with that of the canal. On each side of the veru the mucosa is depressed into sinuses which run laterally to it.

The color of the mucosa is uniformly pink, due to the richness in blood supply. The mucosa permits of considerable traction, but it is easily penetrated by instruments. The surface is, as a rule, smooth and lies in longitudinal folds, which are drawn taut during the tumescent period.

The utricle (Fig. 3) lies in the median line upon the superior surface of the verum. Its average length is 5 mm. and at times it may become greatly enlarged, so as to engage the tip of a sound. The two openings of the ejaculatory ducts (Fig. 3) lie on either side of the verum; they are not always symmetric. The prostatic ducts (Fig. 3), numbering from ten to twenty, open into the floor of the prostatic urethra. They are usually arranged symmetrically in lines.

The folds of the mucous membrane are present only when the penis is quiescent. They lie parallel to the axis and are slightly elevated. They are finest on the verumontanum, but here they are very elastic, to allow for the pronounced turgescence which occurs at this point. The folds are quite pronounced in the floor of the prostatic urethra proper. Lower down they are less hard and are traversed by perpendicular folds, which give to the mucous membrane of this region a fine reticular appearance. In the membranous portion of the urethra they are more elevated. In the region of the bulb the folds are not pronounced, but reappear in the penile portion to become obliterated in the fossa navicularis, where the mucous membrane is quite smooth. There is not infrequently a longitudinal fold on the posterior aspect of the fossa navicularis. This is spoken of as the valve of Guérin (Fig. 2). This is of practical importance in dealing with gonorrhea, and should always be taken into consideration in the passing of instruments which may impinge in its fossa.

The Histology of the Mucous Membrane.—The thickness of the mucous membrane varies in different portions of the canal. Its greatest thickness is in the prostatic urethra. Here the epithelium is of the stratified squamous type, at times showing transitional characteristics. Throughout the bulb and penile portions it is of the columnar variety, and at the fossa navicularis the cells change to the true stratified squamous form, which variety continues to the meatus.

The submucous supporting tissue is of the greatest importance in considering infections invading the urethra. It is not intimately connected with the membrane which forms the base of the epithelial layer. This is shown by the ease with which the epithelial folds can be stretched during erection. The submucous layer carries the blood and nerve supply and the glands of Littré (Fig. 5). These glands were first described by Littré in 1706; they are present throughout the entire length of the urethra. They form linear series all around the urethra in the prostatic region and present the same character as the trigonal glands, which seem to be aberrant Littré glands. Their distribution in the membranous urethra has no regularity. They are much more abundant on the anterior wall than upon the posterior, but fewer in number here than in either the prostatic or anterior urethra. These glands are most numerous in the pendulous portion of the canal. The anterior wall is more richly supplied than the posterior. The glands are much more perfectly developed in the anterior than in the posterior urethra. In the anterior region their excretory canal reaches a considerable length, often as long as 5 mm. In the penile portion they are most numerous in the midst of the erectile tissue, which explains the abundance of secretion at the moment of erection. The secretion from all these glands is a clear mucus. It is the presence of these glands, with their long ducts and complicated structure, that makes the course of gonorrheal urethritis so long and so seriously influences the prognosis. They also are most important factors in contributing to the pathology and complications of the same infection. These points will be considered in detail in their proper places.

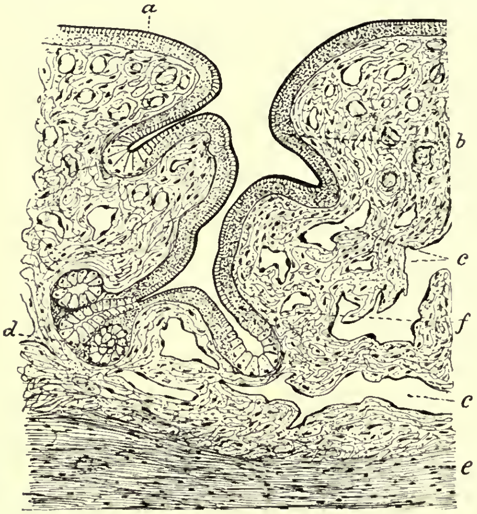


Fig. 5.—Microscopic section of a gland of Littré opening into the lumen of the urethra: *a* and *b*, Lateral branches of the main duct; *c*, *c*, trabeculæ of the cavernous tissue; *d*, deeper acinus; *e*, fibrous layer of the urethral mucous membrane; *f*, continuation of the main duct. (Watson.)

The lacunæ of Morgagni are little culdesacs with large orifices opening into the mucous membrane. They extend from the fossa navicularis to the membranous urethra. They are variable in size, different anatomists also giving varying estimates as to their number. Their practical importance lies in the fact that they contain from thirteen to twenty orifices of the glands of Littré, consequently being the seat of important pathologic changes in urethral infections.

The **muscles of the urethra** are circular and longitudinal. In the prostatic region the muscular bed is smooth, varying in thickness from 1 to 3 mm. Some of the fibers are continuous with the trigone of the bladder. The circular fibers at this point form a sphincter.

In the membranous region the muscular layer is very thin and contains both circular and longitudinal fibers. These fibers are of considerable strength, however, and are of practical importance, inasmuch as it is due to their contraction that spasmodic stricture of the urethra is produced.

The longitudinal muscular layer disappears in the region of the anterior urethra. The circular fibers become thinner and also disappear.

Blood-vessels.—The prostatic portion of the urethra is supplied by the prostatic branch from the middle hemorrhoidal artery and from the inferior vesical. The middle hemorrhoidal and transverse perineal supply the membranous urethra, and the anterior urethra gets its blood supply from the bulbar artery, a branch of the inferior hemorrhoidal.

The veins from the posterior urethra drain into the lateral prostatic plexus and plexus of Santorini, and from the anterior urethra through the dorsal vein of the penis into the plexus of Santorini.

The lymphatics drain from the venous spaces in the spongy area, along the dorsal vein of the penis, into the superficial and deep inguinal lymph-nodes. This is evidenced by the presence of lymphangitis and adenitis in the more virulent forms of gonorrheal urethritis.

The nerve supply comes from filaments of the hypogastric plexus.

CHAPTER II

HISTORY OF GONORRHEA

History.—Our story begins at the fifteenth chapter of the Book of Leviticus, where reference is made to an unclean discharge from the genitals in men and women. Again, the Second Book of Samuel tells us that the curse of God was visited upon the unrighteous Israelites by a "pusy discharge."

The Papyrus of Ebers, the oldest book of the Egyptians upon medical therapy, contains many prescriptions for injections "for the cure of inflammation and obstruction in the urethra." Hippocrates writes at considerable length about the "genital discharge in both the sexes."

Aretæus describes the urethral discharge as "an unpleasant and loathsome contagious disease. By day and by night there is a discharge of cold semen; the flow is thin, colorless, and cold. When contracted by young patients they become haggard, weak, discouraged, indigent, pale, effeminate, lose their appetite; their glands become painful, and they become weak and unfit for anything."

Alexander of Tralles (525 to 605 A. D.) describes two types of "seminal flow," one due to "youthful frequent love lust," and the other due to "uninterrupted excess"; in the latter case the discharge is "rancorous and burning."

A slight advance in the conception of gonorrhea was made by the Arabian, Avicenna (980 to 1037 A. D.). He describes it as an "ardor urinæ," due either to "too frequent coitus which produces a burning during urination without discharge, or to an internal disease of the smallest structures of the urethra accompanied by burning, purulent and bloody discharge."

Then followed (1530) Paracelsus' account of the disease and the description of Thierry de Hery (1552), who calls it "pisse chaude veneriene," the term which is retained in vulgar parlance among the French. One year later the term "gonorrhea gallica" was coined by Antonio Brassavola.

Lorenzo Terrando (1709) was the first to describe the finer structures of the urethra and their involvement by the gonorrheal infection. Ten years later Morgagni (1719) wrote the first comprehensive anatomic and clinical treatise on the disease.

It was not until the beginning of the eighteenth century that a clear understanding was reached that gonorrhea and syphilis are in no way connected with each other. Up to this time it had been supposed that syphilis was always the result of a primary gonorrheal infection.

Then followed years of experimental attempts to produce gonorrhea in animals. The names of Benjamin Bell (1793), James Tongue (1801), and Jean François Hernandez (1812) are associated with this work. However, it required Philippe Ricord (1838) to settle once and for all that the disease was not communicable to any animal.

A period of forty years now elapsed before any further definite knowledge was obtained regarding the nature of the disease. A number of parasites, fungi, and bacteria were isolated and heralded as the cause of gonorrhea. It remained for Albert Neisser (1879) to discover the specific organism. His discovery uncovered the true pathology and paved the way for the therapy which today, in general principle, is more or less followed.

It is interesting to note among the various historic accounts of the treatment of gonorrhea the many different medicaments and methods advised. Strict diet combined with rest, cold baths, topical applications of water, water irrigation; fomentations of wine, vinegar, oils, and salves to the genitals are among the list of therapeutic measures.

Then came the injection era. Among the drugs suggested as curatives the following are to be found: Lead preparations, especially the acetates; lime-water, calomel, and corrosive sublimate; red wine, sulphate and acetate of zinc; copper salts, alum, opium, and last, silver nitrate. In 1802 Heckert suggested the use of medicated urethral bougies or suppositories.

Internal medication dates back to Marco Gatinario (1462), who advised the use of turpentine as a specific for both gonorrhea and syphilis. Cantharides, suggested by Bartholin (1465), next became the fashion. Then came Sylvius' (1674) recommendation of copaiba, and Sydenham's (1680) of balsam of Peru. Unfortunately both of these drugs are still rather extensively and often disastrously used.

John Hunter in 1786 suggested the abortive treatment by rest alone, without any medication, either local or internal.

We thus enter upon the consideration of this infection with a history quite varied and complicated, and in spite of our advanced medical, pathologic, and bacteriologic knowledge we are forced to admit at the outset that we are far from a uniform agreement on a rational and efficient therapy.

CHAPTER III

BACTERIOLOGY OF GONORRHEA

THE Gram-negative intracellular diplococcus, as described by Neisser (1879), found in the purulent discharge from the urethra has been accepted without question as the causative agent in each case where its presence has been demonstrated.

We are today confronted by the revolutionary work of Carl C. Warden which, though contrary to our long-cherished acceptance of the biology of the gonococcus, rings so true to the scientific mind that we are forced to change our views in regard to the biochemistry and morphology of the organism which produces what we have, since Neisser's discovery, accepted as gonorrheal urethritis.

Warden has worked upon the gonococcus and allied bacteria for several years, and his thousands of experiments are so convincing that we must perforce accept his results, which in turn will necessarily have an important bearing upon the future therapy of this specific infection.

The following are excerpts, many taken verbatim, from the masterly communications of this tireless investigator.

Working with twenty-two different strains of gonococci he concludes as follows concerning the morphology, which he shows to be of great variability:

"My experience has been that by using many strains and by varying the medium on which they are grown one can observe all the types of the entire coccus family. By undoubted processes of reversion and variation it is possible and common to observe staphylococcus-like clumping of single forms, short-chain formation, as with the streptococci, lanceolate forms, indistinguishable from pneumococci in shape, diplococci forms resembling the catarrhalis group, all in unquestionably pure cultures of gonococci. All return promptly to strain type on appropriate media."

He recommends as the stain giving the sharpest contour, 1 part of carbol-fuchsin and 3 parts of distilled water.

In comparing the rôle of the staphylococcus in gonorrhea we are astounded by the following dogmatic statements:

"1. Many, if not all, of the Gram-negative intracellular biscuit- or coffee-bean-shaped cocci, observed in the purulent discharge in acute gonorrhea, which are regarded as gonococci and which serve as criteria of diagnosis, are *not* gonococci, but belong to the staphylococcus group. The provisional designation *Staphylococcus urethræ* is suggested for this coccus.

"2. True gonococci are demonstrable with difficulty or not at all in smears of gonorrheal exudate, or in preparation of tissues.

"3. Gonorrhea may be due to a double infection and dependent on a microbial symbiosis.

"4. The diagnosis of gonorrhea rests on *cultural methods only. The old criterion, the microscopic appearance of smears, is unreliable.*

"The diplococci in smears of pus from acute gonorrhea are intracellular, Gram-negative, biscuit- or coffee-bean-shaped, clear cut, sharply outlined, and have a marked avidity for methylene-blue. Comparing these characteristics with those of gonococci from recent cultures we note that single cocci predominate and that they are discrete. Many are irregularly shaped diplococci, many are shadowy and of indistinct contour, some are irregular in size, and nearly all take the methylene-blue stain poorly. They are always Gram-negative. When gonococci are taken up by leukocytes in the guinea-pig or in the test-tube they do not at all resemble the cocci within the leukocyte in gonorrheal pus, but there are cocci, namely, Staphylococci urethræ, which under the same conditions appear identical with them. All my efforts to induce free phagocytosis of live virulent gonococci have failed, whereas the staphylococcus is readily phagocytable.

"These facts lead me to question the identity and rôle of the intracellular diplococci, invariably seen in smears of gonorrheal pus, which hitherto have been accepted as gonococci.

"The designation of *Staphylococcus urethræ* will distinguish the coccus from other varieties of *Staphylococcus albus*, found elsewhere in the body, from which it differs but little. This staphylococcus has been isolated by me from 52 cases of gonorrhea and 20 normal urethras. It may prove to be a habitat of the normal urethra just as the coccus of Welch is a resident in the skin. These organisms do not lie simply in the folds and crypts of the urethral canal. If such were the case they would be recovered more often from the urine. They lie in the cell interstices and follicles of the glands, and slight abrasion of the mucous surface is necessary to liberate them. At any rate it is common to see colonies of staphylococci starting from a single individual or pair adhering to the border or surface of an epithelial cell.

"From observation of cultures and a large number of phagocytosis experiments with fifteen strains of staphylococci, I have been led to believe that within the urethra during gonorrheal inflammation the staphylococcus may be Gram-negative, whereas without the body in ordinary cultures it is Gram-positive.

"The action of staphylococcic and gonococcic antisera upon the staphylococci favors phagocytosis.

"Suspension in diluted serum for long periods of time acts similarly to suspension in undiluted serum for shorter periods of time.

"If we accept the conclusion of Benians in regard to Gram-positiveness of staphylococci, namely, that it is due to the action of iodin on the cell wall of the cocci, which prevents the alcohol from washing out the stain, it is possible to account for the loss of the stain by the physiologic change represented by the biscuit form.

"It is possible that the toxicity of the staphylococcus induced by serum and possibly evident by the Gram-negative state exert an influence locally in the urethra during the course of gonorrhea, and also on the body as a whole, greater than has been supposed."

It has long been recognized that co-artificial cultivation of the gonococcus is a matter of considerable difficulty. It will grow under the most minute test and then on only specially prepared culture-medium at body temperature; the slightest variation in the surroundings will prevent its growth. In connection with this, Warden notes that as the infection progresses the gonococcus is less and less in evidence in the cultures, until finally about the sixth or eighth week it has disappeared altogether. The time corresponds fairly accurately with that at which the complement-fixation test is strongest. Of greater interest in this connection is the fact that the complement-fixation test for *Staphylococcus urethræ* is directly parallel to the gonococcus test.

Outside the body the gonococcus is very easily killed, the weakest antiseptic solution, raising or lowering of the temperature, or desiccation, will in a short time kill the organism. The question then that will arise is: Why is eradication of the gonococcus from the urethra difficult? The pathology of the infection, taken up later, furnishes the answer to this question.

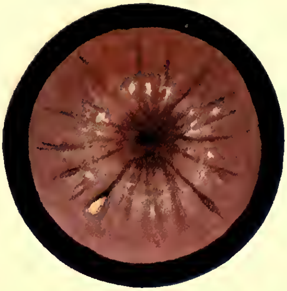
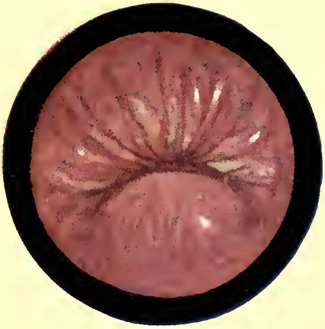


Fig. 6.



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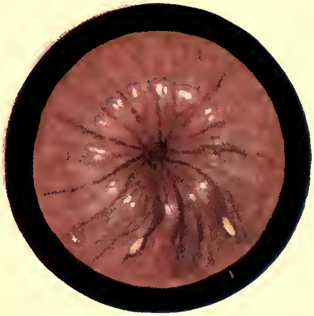

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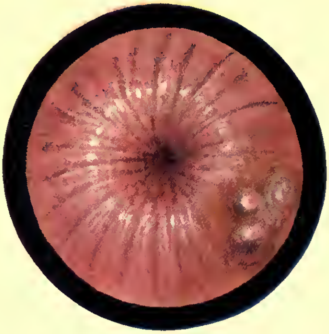

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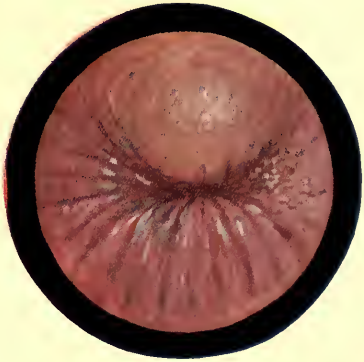

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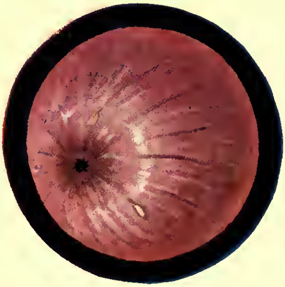

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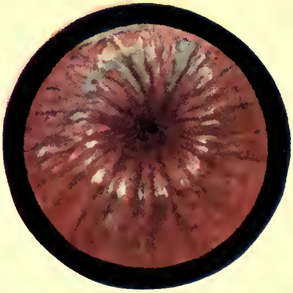


Fig. 12.

Fig. 6.—Acute gonorrhea. Third day after discharge was first noted. Evidently a less virulent infection than in Fig. 7. The folds of the mucosa are evident.

Fig. 7.—Acute gonorrhea. Fourth day, showing the pronounced hyperemia. The swelling of the mucous membrane is so marked that the folds are scarcely to be seen. There is some pus exuding from the crypts of Morgagni.

Fig. 8.—Gonorrhea one week old. Navicular portion. The distortion of the mucous folds is very marked, suggestive of a beginning abscess seen later, and shown in Fig. 9.

Fig. 9.—Three small abscesses seen one week later than the condition as shown in Fig. 8, or two weeks after the beginning of the discharge. These abscesses were punctured. They closed a few days later and did not re-form.

Fig. 10.—Acute infection engrafted upon a chronic urethritis. The acute attack is ten days old. The previous infection was ten months. The acute pathology is represented by the marked edema and pus exuding from the crypts. The granulations are indicative of the chronic condition.

Fig. 11.—Gonorrhea two weeks old. A virulent invasion. The lumen of the urethra is markedly dislocated by the swelling.

Fig. 12.—Gonorrhea four weeks old. The pathology is much more intense than in Fig. 11. Evidently a very virulent strain. The degree of hyperemia and pus formation is very pronounced. Note the profuse suppuration and hemorrhage into the lumen. A large abscess formed (Fig. 13) a few days later.

CHAPTER IV

THE PATHOLOGY OF GONORRHEAL URETHRITIS

The infection probably begins with the lodgment of the gonococcus in the fossa navicularis by suction at the time of ejaculation. It spreads by the propagation of colonies in a manner similar to the growth of the organism in the test-tube. The infection probably spreads by direct proliferation of the organism.

The **progression** that takes place is first a superficial hyperemia (Figs. 6 and 7), due to the influence of the toxins liberated, according to Warden, by autolysis of the gonococci. The invasion may extend then in either of two ways: Along the upper layers of the mucous membrane, or into the deeper layers through the ducts of the glands of Littré, thus involving the submucous connective tissue and the other structures of the penis—the cavernosa and spongiosum. The picture now becomes one of any pyogenic infection: edema, vascular changes with leukocytic emigration, necrosis and necrobiosis, with pus formation in the regular order of suppurating inflammation.

The severity of the attack depends first upon the virulence of the gonococcus; second, the resistance of the patient, and, third, previous attacks. This last point brings up the question of immunity. That there is a comparative immunity cannot be doubted. In almost every instance the first attack is the most severe. It is uncommon to see any complication occurring in subsequent infections. Just why such is the case remains for future workers to discover, but it is reasonably logical to assume an acquired immunity.

To resume our pathologic study, we consider first a retrogression influenced by the leukocytosis produced either by direct stimulation from the gonococcic toxins, or aided by the influence of drugs used in instillations. The gland ducts remain patent, drain spontaneously, the edema and hyperemia gradually disappear, and complete resolution takes place.

On the other hand, the opposite may often occur, the ducts become infiltrated, "their mouths are glued over," thus harboring the gonococci, which may continue their activity and produce miliary abscesses or large abscesses which rupture either into the cavity of the urethra or externally, producing fistulæ.

If the virulence of the bacteria is diminished, they may produce a less violent reaction or remain dormant for an indefinite period of time, when without any warning they again invade the urethra and produce a subacute infection.

Among other lesions that occur are small superficial erosions (Fig. 16) or ulcers that may develop at any site along the mucous membrane. Fissures (Fig. 17) usually follow the crypts of Morgagni, and may prove to be very deep. The formation of granulations is one of the common processes in prolonged attacks; these may be discrete or diffuse and vary greatly in number. They are of two varieties: the soft type, which bleeds easily (Fig. 18), and the infiltrating type, probably representing a more advanced change (Fig. 19). The latter extend more deeply and, if numerous, undergo a subsequent metaplasia, producing a narrowing of the lumen of the urethra or formation of a stricture.

Thus is pictured the progression, retrogression, resolution, and non-resolution of the invasion of the urethra by the gonococcus.

Fig. 13.—Abscess of the bulbous portion formed during the fifth week (Fig. 12). This was incised and drained for many weeks, leaving a fistula (Fig. 14) which has never (two years ago) healed.

Fig. 14.—Intra-urethral fistula resulting from a gonorrheal abscess (Fig. 13). The tract runs deep into the spongy portion of the penis. A mucopurulent discharge can be expressed from the opening, which at times still (two years after formation) shows gonococci.

Fig. 15.—Sixth week after the initial discharge. Delayed retrogression is taking place. The punctate areas are the mouths of the ducts of the Littré glands. There is quite a hemorrhage into the lumen produced by the scraping off of granulations by the endoscope.

Fig. 16.—Two erosions of the mucous membrane three months after the beginning of the infection.

Fig. 17.—Deep fissure of the mucous membrane. Note the pronounced edema.

Fig. 18.—Ten weeks after beginning of the infection the inflammation has assumed a distinct chronic character. The granulations are of the soft, easily bleeding variety and are very diffusely distributed.

Fig. 19.—Chronic urethritis. Three months after the beginning of the infection the discharge continues, but shows very few gonococci. The granulations here shown are of the infiltrating type and display a strong tendency to produce scar tissue. The hemorrhage is traumatic, due to the instrumentation, and comes from above the point from which the drawing is made.

Fig. 20.—Chronic posterior urethritis as seen through the Buerger posterior urethroscope. Pronounced granulation formation upon the veru.

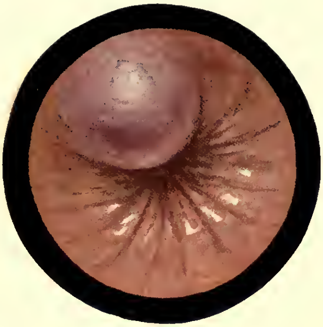
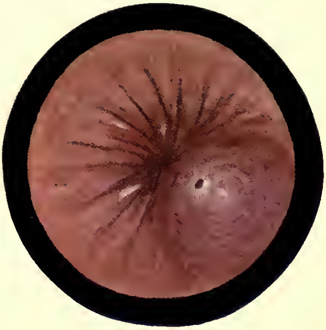


Fig. 13.



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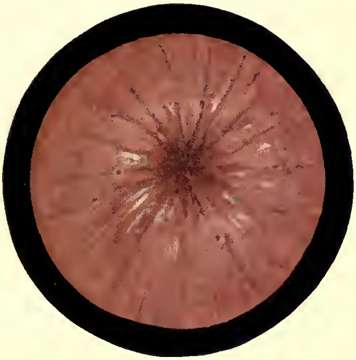

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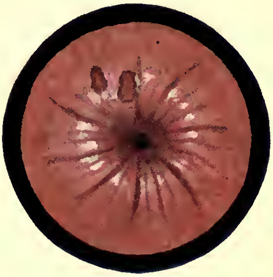

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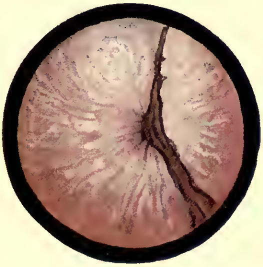

Fig. 17.

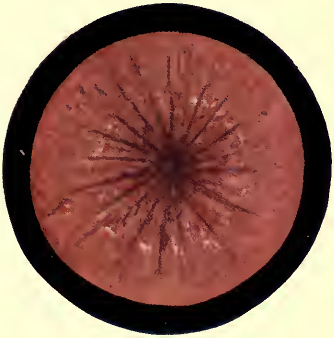

Fig. 18.

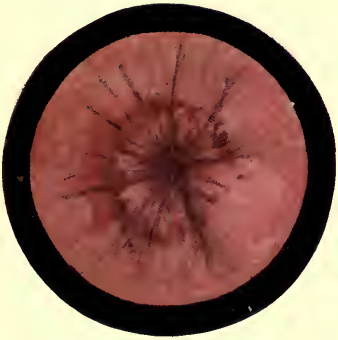

Fig. 19.

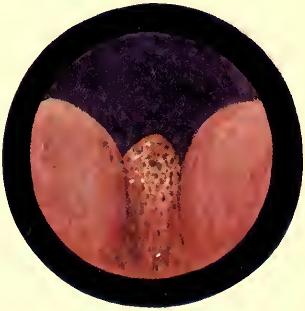

Fig. 20.

CHAPTER V

THE SYMPTOMATOLOGY, DIAGNOSIS, AND COURSE OF GONORRHEA

SYMPTOMATOLOGY

Incubation.—Symptoms of the infection may become manifest in from twenty-four hours to fourteen days. This is a wide variation of time, it is true; but not infrequently a discharge develops where there is definite proof that the exposure occurred only twenty-four hours previously. There are a few cases on record, too, where a gonorrheal discharge has appeared as late as twenty-one days after exposure. The average time, however, is from seven to ten days.

The Discharge.—Until some more reliable method of differentiating the Neisserian organism has been evolved we must still conclude, upon finding a Gram-negative intracellular diplococcus, that we are dealing with the gonococcus.

The discharge varies considerably, according to the time at which it is examined, following its first appearance. Within the first twenty-four hours it is of a thin, watery consistency and may show few organisms, if any, after a very prolonged search. After twenty-four hours the discharge changes considerably in its general characteristics. It rapidly becomes thicker, and is of a yellowish-green color. At the end of the acute stage, usually within ten to fourteen days, we have wide variations in the appearance of the discharge. It may be thin and watery, at times thick, without the characteristic, yellowish-green color, and again it is the typical gonorrheal pus. After the acute stage it may again vary: namely, in the early morning the consistency may be very thick; during the day it may assume the thin or watery type, and the presence of gonococci may be very inconstant. As a rule, however, they may be found in the early morning discharge, which represents an accumulation of the secretion of the night. Then there may be an intermittent disappearance of the gonococcus, together with the discharge. There may be days when there is no discharge at all or the gonococci may be entirely absent from the secretion, when without any warning there will be a profuse discharge containing the organisms in great numbers. If the discharge assumes its watery consistency early in the disease, all that may be found in the urine is a few specks, otherwise it will remain perfectly clear. After the first twenty-four hours, however, there is usually a considerable amount of turbidity, giving evidence of the typical character of the infection.

The Urine.—The location of the infection may be determined with the so-called "glass test." The only practical one is the two-glass test, which is neither necessary nor essential, as it is not a difficult matter to differentiate between an anterior and posterior urethritis symptomatically or subjectively without it. However, in most instances it will be found that if a patient has a sufficient quantity of urine in his bladder and will urinate a considerable amount into the first glass, it will be turbid from the pus that is washed out of the infected portion of the urethra. The second glass will be perfectly clear, or nearly so, showing that the urine coming over the remaining portion of the urethral surface does not carry with it any infectious material.

At the end of the acute stage we may get a wide variation in the gross appearance of the urine. First, there may be a marked turbidity of urine in the absence of any discharge whatever, and this is without question an evidence that the gonorrheal infection still persists. A careful examination of the stained sediment of a centrifuged specimen will in every instance show the presence of the gonococcus. Depending upon the time of day that the specimen is examined, there may also be variations in the appearance of the urine; in the early morning when there is an accumulation of the night secretion there is, of course, a marked turbidity; again, during the day the urine may be almost clear. There is one point upon which a great deal of emphasis should be laid;

namely, the differentiation between phosphaturia and pyuria. During the course of a gonorrheal infection this is readily determined, inasmuch as a few drops of acetic acid added to the specimen will completely clear it in the absence of pus. The so-called "pus particles or clumps" so frequently found will, if examined under the microscope, show exfoliated mucous membrane with the gonococcus in varying numbers lying intracellularly.

There may also be pus shreds, or "tripperfaden." These must be differentiated from the mucous shreds, showing upon examination only mucus with possibly a few scattered leukocytes, which usually do not contain any gonococci. The pus shreds, or "gonorrheal threads," are heavier and sink to the bottom of the glass, and will upon examination show large numbers of both gonococci and leukocytes. The intermittent clearing of the urine with a comparative freedom from turbidity and shreds, followed without warning by a recurring turbidity, is one of the common occurrences in the acute and subacute stages of gonorrheal urethritis.

Blood in the urine usually is a terminal occurrence and represents probably the squeezing out of some of the red cells from the highly congested area. Occurring at the end of the urinary act, it is probably produced by collapse of the walls of the urethra. A severe terminal hematuria is, however, frequently seen in an intense posterior urethritis.

Subjective Symptoms.—The patient may be free from any subjective symptoms throughout the entire course of the disease. This, however, is true as a rule only where the process is limited to the anterior urethra.

Dysuria.—Actual pain in urination associated with gonorrheal urethritis is, in the author's experience, only present in involvement of the posterior urethra. It is true, however, that the patient may experience a sense of burning or discomfort in the anterior urethra in the course of a severe reaction, such as is found in edema of the meatus and prepuce. Pain in the posterior urethra is produced by the contraction of the inflamed sphincter muscles at the end of the urinary act.

The "burning" may also be present in a slight or non-virulent infection of the canal, due simply to the acid urine passing over the inflamed mucous membrane.

The Frequency of Urination.—It is the experience of the writer that there is no frequency of urination due to the disease itself except in involvement of the posterior urethra. If present in involvement of the anterior urethra alone, it is due to the fact that the patient imbibes large quantities of water, as prescribed under the treatment.

The Systemic Reaction.—This is not very often observed, and then only in the presence of involvement of the posterior urethra. It may be quite marked and be associated with malaise which, in turn, may be associated with chills and elevation of temperature. In some instances it may become very marked, showing a picture of a mild form of sepsis. Severe gonorrheal infection is often accompanied by lymphangitis and inguinal adenitis. Within the experience of the author, suppuration has never occurred in inguinal adenitis where the infection was purely gonorrheal, but this is frequently the case where the staphylococcus is associated. This complication is not rare among dispensary patients, but uncommon in private practice.

DIAGNOSIS

Until some more practical method is evolved, our diagnosis must be based upon the examination of the discharge. It must be borne in mind that the morphology and staining characteristics of the gonococcus are likely to be deceptive, and with this mental reservation we proceed.

In questionable cases, do not fail to resort to culture and then see that it is made by one experienced in laboratory technic. This is of great medicolegal importance. We should always remember that a specimen of urethral discharge under the microscope cannot be sworn to as showing gonococci, even though all their long-accepted biologic characteristics are represented. A case was lost in court recently because of an oath taken to such an exhibit, without the support of cultural evidence.

This point, too, is of great social importance. Sweeping accusations should never be made, if there is any danger of marital rupture. The more modern methods of laboratory diagnosis should be resorted to, and in questionable cases judgment may be passed only with the most profound reservation.

COURSE AND PROGNOSIS

Although distinctly an exaggeration, Ricord's dictum, "Gonorrhea begins and the Lord only knows when it ends," is in principle scientifically quite correct.

In considering the duration of a gonorrheal infection, four points must be considered:

1. Duration of the acute stage.
2. Recurrences or acute exacerbations.
3. Persistence of the gonococcus in the genito-urinary tract.
4. Danger of infecting the female.

In uncomplicated cases presenting early for treatment where only the anterior urethra is involved and the patient is willing to follow instructions carefully, the disease should be clinically cured in from ten days to six weeks. In 60 per cent. of the cases where treatment is begun within twenty-four hours after the discharge first appears, the disease should be cured in ten days. The remaining 40 per cent. of the cases will vary in duration from six weeks to six months. The author has rarely known an anterior urethritis to last any longer. In this event there is serious doubt of its being due to the gonococcus alone.

The average duration of the infection is considerably longer in posterior urethritis, depending upon the extent to which the prostate and seminal vesicles are involved, as they usually are in some degree.

The infection may seemingly yield promptly to treatment and no evidence of the disease be manifest for days or even weeks, when, without warning, following the use of alcoholic stimulants, violent exercise, or sexual excitation, the discharge reappears, as profusely as at the beginning of the infection. These acute exacerbations may recur many times, each one requiring days or weeks to subside.

There is a wide range of opinion as to the length of time the gonococcus may persist in the male genito-urinary tract. Some authorities still believe with Noeggerath that it can never be definitely known when the gonococcus has disappeared. This opinion is, of course, most absurd. Under this caption E. L. Keyes, Jr., whose opinion the author accepts without question, states that he has "never known the gonococcus to persist in the male urethra for more than three years, while in at least 90 per cent. of cases it disappears with or without treatment within a year." It is, of course, absolutely impossible to know in each case exactly when the individual ceases to harbor the gonococcus, but if the following rules are observed it will be very rare indeed that error will occur.

If the infection was *limited to the anterior urethra*, as determined from the clinical history, and every evidence of the disease has disappeared, *one year must have elapsed from the time of the last evidence of the infection before consent is given for marriage.* The patient is then put through a series of tests to be described subsequently.

If the infection extended into the posterior urethra, thereby involving the prostate and seminal vesicles, *then two years must elapse* (in which laboratory tests remain negative) *after the final clinical disappearance of the disease.*

Instrumentation, alcohol tests, and strenuous physical exertion are tried. The patient is furnished with slides upon which any morning discharge is placed, and carefully examined. The first urine is collected, centrifuged, and examined bacteriologically. Cultures are made the following day from the discharge and from urine and prostatic secretion obtained by massage. In some instances the cultures are taken from the semen ejaculated into a sterile condom.

At this point the value of the complement-fixation test should be considered from a prognostic point of view. Up to this time it is not known how long after a gonorrheal infection the patient's blood will give a positive reaction. It is also not absolutely known whether a positive test means the presence of dormant gonococci or whether the elements in the blood-stream necessary for the serum reaction alone account for the positiveness of the test. From a scientific standpoint this blood test is full of interest and no doubt will in the future be of the greatest aid to the urologist in determining the fitness of a candidate for marriage.

The complexity of the technic in preparing the antigen, and the wide variation in results of the various observers, depending on the antigen used, all tend to make the absolute value of the fixation test at present uncertain. The author therefore is not at present influenced by the test in his judgment in determining the advisability or not of matrimony, though he heartily recommends its use in every instance from the standpoint of scientific interest in helping to place it upon a firm diagnostic and prognostic basis.

The question of the marriage of gonorrheics should be given the most serious consideration by the entire medical profession. It is amazing, however, how little knowledge the average general practitioner has regarding the length of time a patient who has had a gonorrheal infection is capable of transmitting it. Every man in the practice of medicine knows of more than one case where a honeymoon was abruptly ended by the bride's falling a victim to the ravages of the gonococcus, with resulting sterility and invalidism.

In concluding the subject of gonorrhea and its relation to marriage, two exhortations are in order. First: Fathers should interview their prospective sons-in-law to inquire into their genito-urinary condition as well as their financial status. Second: A more serious inquiry by general practitioners, who are much more frequently consulted than are genito-urinary specialists regarding the gonorrheal history of their patients.

CHAPTER VI

TREATMENT OF GONORRHEA

PROPHYLAXIS

Of Nature's three most powerful instincts, hunger, thirst, and sexual desire, the last is most often repressed. Yet statistics gathered in the past decade show a colossal increase in venereal disease, chiefly gonorrhea. It is estimated that in the United States 75 to 85 per cent. of the male population either are or have been infected with gonorrhea.

To absolutely prevent gonorrhea we must advise refraining from illicit sexual intercourse. From the urologist's viewpoint the futility of such advice is self-evident. It is clearly a question of distinguishing physiologic man from moral man, and therefore admits of no argument. Consequently we must dismiss our philosophy and consider the subject from a purely medical angle.

"Coitus condomata" is the chief method of preventing gonorrheal infection. This fails only occasionally when the condom is defective and breaks during the sexual act. There is a widespread superstition among the laity that the use of the condom is injurious. Many men also claim that its use detracts from sexual pleasure and they risk infection rather than take this precaution against it. The fact remains that the condom is the one reliable preventive measure.

The injection of the silver salts into the urethra following coitus has proved valuable in reducing the number of cases of gonorrhea. The following results are quoted from the United States Army and Navy Bulletin. The treatment is as follows:

1. Wash the penis with 1 : 5000 bichlorid of mercury solution.
2. Urinate and take a urethral injection of 2 per cent. protargol solution.

3. Rub 50 per cent. calomel ointment well into the foreskin, head, and shank of the penis, with particular care about the frenum.

Treatment taken within eight hours after exposure shows 1.3 per cent. of infection; after eight to twelve hours, 3.3 per cent., and between twelve and twenty-four hours, 5 per cent.

These figures are an average taken from several reports of Army and Navy surgeons.

The author has been quite successful with these preventive injections, not one case of gonorrheal urethritis having developed. No promises are ever made unless the instillation is given within eight hours after exposure.

The urethra is entirely filled with a 2 per cent. solution of albargin, or if this is not obtainable, a 2 per cent. solution of protargol. This is retained fifteen minutes and then a toothpick applicator saturated in either the albargin or protargol is inserted into the meatus as far down as the fossa navicularis and held there fifteen minutes.

ACTIVE TREATMENT

General Considerations.—*Diet.*—There is not so much importance to be placed upon the diet as was formerly thought. There are a few articles to be interdicted, such as highly spiced and acid foods, tea, coffee, and, most important of all, alcoholics.

The hygiene of the patient is very important. He should take great care to avoid sexual excitation. The bowels should be well regulated, as constipation is conducive to extension of the infection into the posterior urethra, prostate, and seminal vesicles.

Rest in bed is the ideal treatment at the very beginning of the disease. However, there are few men who will submit to this. Many cases of urethral gonorrhea would spontaneously disappear under complete rest, light diet, and the imbibition of large quantities of water. Any violent exercise should be firmly forbidden. Tennis, swimming, running, motoring, all have a tendency to induce extension of the infection from the anterior to the posterior urethra.

Hydrotherapy.—The use of water, both internally and externally, is one of the most important therapeutic measures in combating gonorrhea. Patients are requested to drink 20 to 25 glasses of water a day. The rationale of this procedure is self-evident. The resulting frequent urination cleanses the urethra and acts as a natural irrigation, in fact, the only irrigation not fraught with danger.

The external application of water is usually carried out by immersing the penis in a container, such as a pint cup, filled with hot water at about 120° F. The water should be changed as soon as it becomes cool. Each bath should last fifteen to twenty minutes and be repeated every hour or as often as indicated. Phimosis, paraphimosis, edema of the prepuce and meatus, dysuria, and painful erections all call for this method of hydrotherapy.

Medicinal Therapy.—The internal administration of drugs has become obsolete, and justly so. The various balsams, copaiba, and sandalwood oil, which have been heralded for so long, have rarely accomplished anything and have often done great harm by producing renal and gastric disturbances. Their use should be strongly discouraged, as they are never indicated.

If the patient complains of "burning" during micturition the urine should be made alkaline. This is readily accomplished with bicarbonate of soda in teaspoonful doses two to three times daily. Should this be distasteful, a simple alkaline mixture may be prescribed:

Potassii citratis	20 gm.
Liq. potassii	12 gm.
Syr. glycyrrhizæ	120 gm.

Sig.—Teaspoonful three times daily.

Local Medication.—The ideal medicament for local use would be one highly gonococcidal, markedly penetrating, and non-irritating. Unfortunately we have no such drug.

Before entering into the minutiæ of local treatment, the rationale of this form of medicament must be considered. A word of recapitulation concerning the pathology of the disease also is in order.

It must be remembered that we are dealing with a local infection. The invading bacteria lie on the surface of the mucous membrane and in the submucous layer. Complicated glands harbor the gonococci which are held prisoners in both the glands and their ducts.

Two processes must be put to work—a process for destroying the bacteria on the surface and a penetrating process or a local reaction by which the bacteria of the deeper layers are destroyed. The blood reaction of leukocytosis is the greater factor in the latter process. This leukocytosis or phagocytosis is aided by the stimulating effect of the medicaments introduced into the urethra.

Therefore, it is self-evident that great care must be taken to avoid the use of any drug that has an astringent action.

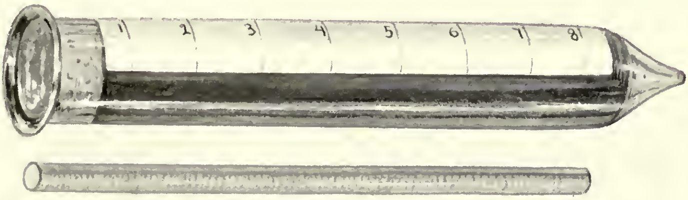

Fig. 21.—Albargin ointment in tube ready for injection.

The silver salts have long been known to have, as nearly as it is possible to obtain, a specific germicidal effect upon the gonococci. Various combinations of silver and albumin have been upon the market. All of these have had their advocates and have been tried out experimentally as well as clinically. Albargin has given, on the whole, the best results and is used exclusively by the author. Protargol is next in efficiency. Argyrol is not recommended, inasmuch as it has no penetrating power, is very weakly germicidal, and has very little stimulating effect.

The author employs albargin in the form of a semisolid or ointment, 1 per cent. in strength, which melts at body temperature. The base of the preparation is gelatin and tragacanth, with a small amount of glycerin for its hygroscopic influence.

The preparation put up by Dinet & Delfosse of Chicago is in glass tubes (Fig. 21), the tips of which are conical.

This method of urethral medication has the advantages of cleanliness and ease of application, inasmuch as syringe and medicament are combined. Moreover, and this is of greatest importance, a quantity of the semisolid material will cling to the mucous membrane, while a liquid would all be expelled as soon a the meatus were released. This is a distinct advantage, since it is quite natural that greater efficiency from medication is to be obtained the longer the medicament bathes the inflamed tissue.

These tubes are graduated in order that the amount for each injection may be easily gauged by the patient.

The rationale of this tube method of injection is threefold: cleanliness, convenience, and a prolonged application of the medicament to the mucous membrane.

Thus far the **vaccine treatment** of gonorrhea has been a failure. Some isolated results have been reported, but on the whole, even in the arthritic complications, the results have been quite unsatisfactory.

In the light of our present knowledge of the biology and chemistry of the gonococcus, probably we can explain the failure of vaccine therapy. More exactly, this is due to the autolysis of the gonococcus "which renders immunity response of animals and man to injection of the organism unsatisfactory and incomplete" (Warden).

It may seem rather strange to dismiss this trite subject which has given rise to such a wide range of opinion. In the author's hands the various vaccines have not proved to be of any definite value in either gonorrheal urethritis or its complications, with the possible exception of joint involvement. These cases have been so few and in every instance have been treated with other measures, so it is impossible to state that the vaccines *per se* were responsible for the curative results. This view is held by the majority of urologists, but hopes are still entertained that, with the increase of our knowledge of the behavior of the gonococcus, a vaccine will be obtained which will produce therapeutic results.

THE MINUTIÆ OF TREATMENT

Inasmuch as the time-tried microscopic diagnosis of the gonococcus in urethral discharge has recently been revolutionized, the question now arises whether it is ever possible to abort gonococcal infection of the urethra. However, until we have a more practical method of differentiating the gonococcus from allied bacteria we must retain our present methods.

As stated under prognosis, 60 per cent. of patients with gonorrheal urethritis, if seen within the first twenty-four hours after the discharge has begun, can be cured in from five to ten days.

The patient is strongly advised to go to bed for from forty-eight to seventy-two hours. Fifteen to 25 glasses of water should be drunk during each twenty-four hours. Urethral instillations of albargin are begun at once. The urethra is well distended and *each injection is retained fifteen minutes.* After the instillation has been allowed to escape a toothpick applicator is saturated with albargin and inserted into the meatus as far down as the corona, where it is allowed to remain fifteen minutes longer.

The strength of albargin used depends somewhat upon the amount of irritation produced by the first application. Some urethras are much more tolerant to the drug than others. A few patients cannot tolerate it at all and after one or two injections will refuse to allow its further use. In such cases protargol is substituted, ½ to 1 per cent. in strength.

In the beginning a 2 per cent. solution should be used. This strength cannot be borne for more than two instillations in the twenty-four hours. Three to four should be given, the intermediate ones being of 1 per cent. strength. The irritation is markedly relieved by immersing the penis in hot water after the instillation. The burning during micturition is best ameliorated by sodium bicarbonate in teaspoonful doses two to three times daily.

After the first twenty-four hours, if gonococci are found, the chances are that the abortive treatment has failed. If no gonococci are found, however, it cannot be assumed that the treatment has been successful, as subsequent examinations may reveal them.

Should no gonococci be found after twenty-four to thirty-six hours, the injections are stopped. The discharge is examined several times during the day. Prolonged search for the cocci should be made in the morning specimens which represent the accumulated secretion of the sleeping hours. After the findings are negative for twenty-four hours more the alcohol test is advised, preferably a glass of beer or ale. If this test is negative, careful observation of the urethral secretion for the next two or three days is followed by the introduction of either an anterior sound (Fig. 22) or bougie à boule into the anterior urethra to a depth of 2 or 3 inches (Fig. 63, *A*). The urethra is massaged over the instrument and the following morning the secretion is examined. Should this test prove negative, the patient may be told with reasonable assurance that the infection has been eradicated, although he should remain under observation for an interval of a week or ten days. No further attention need be given to the urine, which will contain a few particles or "shreds" of mucous membrane due to the chemical irritation of the albargin; these will disappear spontaneously.

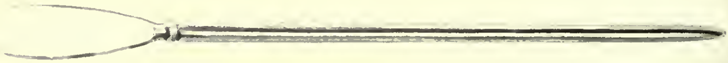

Fig. 22.—Anterior sound.

Now we turn our attention to the 40 per cent. in which abortive treatment has failed. The first consideration is those cases in which the infection is limited to the anterior urethra. The author's experience is that 98 per cent. of the cases coming under his personal treatment from the beginning of the disease, that is, within twenty-four hours after the discharge has first appeared, have the infection confined to the anterior urethra.

Extension of a gonorrheal urethritis to the posterior urethra is due to the fact that the patient either ignores the discharge in the beginning or refuses to follow his physician's advice. Other causes of extension are very virulent infections, lowered resistance of the individual, or maltreatment at the hands of the physician.

Urethral irrigations, in the author's opinion, are responsible for the greater number of cases of extension into the posterior portion of the canal. The general practitioner is strongly urged not to use irrigations of any kind during the process of a gonococcal invasion.

The albargin injections are continued as long as the gonococci show in the discharge, or as long as the urine remains turbid. The patient should report daily once for a 2 per cent. injection and should give himself two injections of a 1 per cent. strength, preferably in the ointment base, as described.

The discharge should be examined from time to time, that collected in the morning being most important. As soon as the urine is clear and the gonococci are absent in the discharge, stop the injections and make further microscopic examinations. When the findings have been negative for a few days, use the alcohol test followed by massage of the anterior urethra over a sound. After a period of a few days, frequent observations of either the discharge or a stained specimen of the sediment of the centrifuged urine will almost invariably show the diplococci.

After a reasonable period, arbitrarily two weeks, if no gonococci have been found in either the discharge or the urine the following procedure should be tried:

For the persistent watery discharge present in about 50 per cent. of the cases a mild astringent mixture may be given the patient, to be used one to three times a day and retained five to ten minutes. The astringents are used in an ointment base in the same method as the albargin. The simplest mixture has been found to be the best:

I.	Zinc sulphate	1.5 gm.
	Alum	0.5 gm.
	Aqua dest.	100.0 gm.
II.	Copper sulphate	2.5 gm.
	Glycerin	50.0 gm.
	Aqua dest.	50.0 gm.

Either of these two is efficient, though the second prescription may be a trifle more irritating.

The urine now contains one of two kinds of threads, mucus (Fig. 24) or pus (Fig. 25). The former are to be entirely disregarded, as they will inevitably disappear spontaneously if the infection has been limited to the anterior urethra. The pus threads, or "gonorrheal threads," as they are sometimes called, are caused by an exfoliation of the mucous membrane. Nature will do considerable toward reducing this process and it can be assisted by gentle massage over sounds in the anterior urethra followed by anterior instillations of $\frac{1}{4}$ of 1 per cent. nitrate of silver, increasing to 1 per cent. This treatment is to be given two to three times weekly.

Two precautions should always be observed: Do not be in too great a hurry to instrument, and do not use astringents too soon. When uncertain, it is much better to wait a bit longer, as no harm can be done, whereas astringents used too soon may seal up inactive gonococci in the glands or gland ducts, to become active later. This is not the gonorrhea "coming back," because, in reality, it has not been cured.

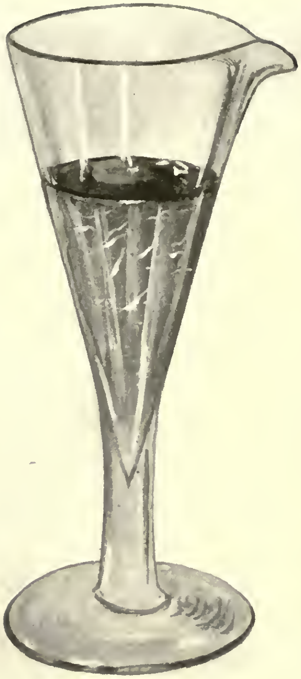

Fig. 24.—Mucus shreds and a transparent urine.

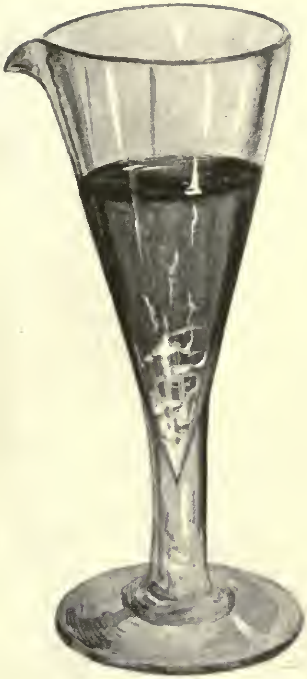

Fig. 25.—Pus shreds and turbid urine.

CHAPTER VII

THE COMPLICATIONS OF GONORRHEAL URETHRITIS

POSTERIOR URETHRITIS

The primary consideration is the extent of involvement of the prostate and seminal vesicles.

Insist upon complete rest in bed for two or three days at least, when the acute symptoms usually subside. If this is not feasible or is refused, have the patient wear a well-fitting suspensory. The type made under the trade name of "The Sport," by Bauer & Black (Figs. 26 and 27) of Chicago, is the most satistory.

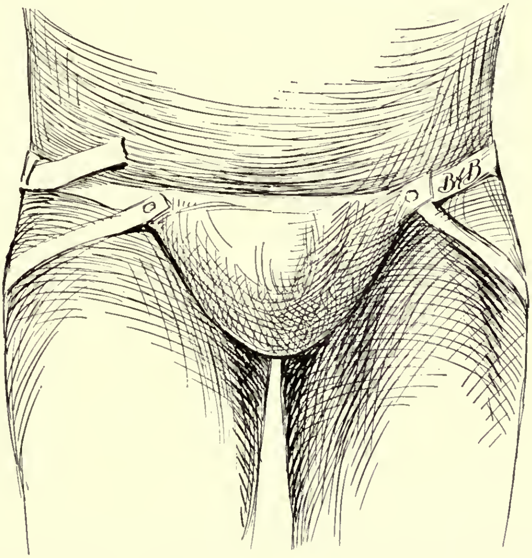

Fig. 26.—The suspensory recommended by the author. The penis-flap closed.

Attention is now turned to relief of subjective symptoms. Sitz baths should be given with the water at from 100° to 120° F.

for fifteen minutes at each sitting, and repeated as frequently as necessary, care being taken, however, that the patient is not weakened. Rectal suppositories containing ichthyol, extract of belladonna, and pulverized opium should be used three to four times daily, according to the need.

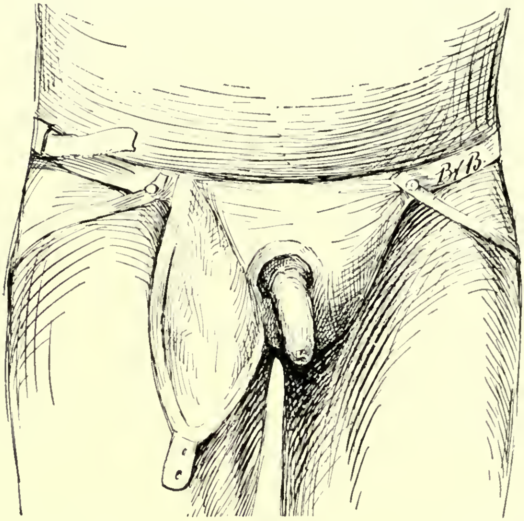

Fig. 27.—The penis-flap open. This is removed during an acute gonorrhea in order that better drainage may be obtained.

Ichthyol	4 gm.
Ext. belladonna	0.097 to 0.195 gm.
Pulv. opium	0.195 to 0.780 gm.

Made into twelve suppositories.

The amount of fluid intake should be reduced to the minimum and all urethral injections stopped, as they are ineffectual and distressing during the acute stage.

The use of large quantities of sodium bicarbonate is advisable, as it will do a great deal to allay the burning and tenesmus.

As soon as frequent and painful micturition have diminished the injections should be resumed and large quantities of water should be taken.

As a rule, anterior instillations will suffice. The capacity of the posterior urethra is not over 1 c.c., and if the anterior urethra is well distended enough of the injection will trickle through to bathe the mucous membrane of the posterior urethra.

The old exhortation of compressing the "cut-off" (the sphincter muscle) to prevent the injection from "going back" is not well founded. Injections should always be given slowly and just after micturition.

The albargin injections (2 per cent. once daily and 1 per cent. twice daily) should be persisted in as long as the gonococci are found in the discharge or the urine remains turbid.

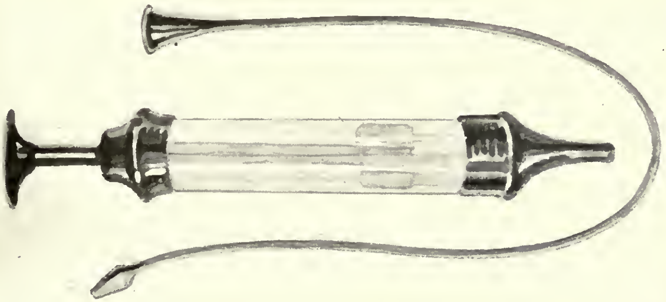

Fig. 28.—Guyon catheter and syringe.

After prolonged treatment (six to eight weeks), if the second glass test shows a turbid urine, posterior instillations may be considered. These should be given with great care, using only a very small tipped Guyon catheter (Fig. 28). Not more than 1 c.c. should be injected at a time. The posterior injection should always be followed by an anterior injection.

At this period hexamethylenamin in 0.3 gm. doses four times daily will occasionally be of value in helping to clear the urine. If it increases the irritation it should be discontinued at once. Of course no bicarbonate should be used in combination with hexamethylenamin, as it is effectual only in an acid urine.

The same routine should now be followed as described under anterior urethritis. Even greater caution, however, must be observed not to use instruments or astringents too soon. The sound should now be passed back into the posterior urethra; also the astringent instillations, which are introduced through a Keyes' instillator (Fig. 29) or a Guyon catheter.

Subsequent procedures are now directed toward the prostate and seminal vesicles, which will be considered separately, and toward the persisting discharge and threads in the urine.

The so-called "gleet" and "chronic gonorrhea" are unfortunate terms, the former meaning nothing and the latter not truly existing. So long as the gonococcus is present the clinical state is subacute, and at any time may produce an acute exacerbation just as active as the beginning of the disease.

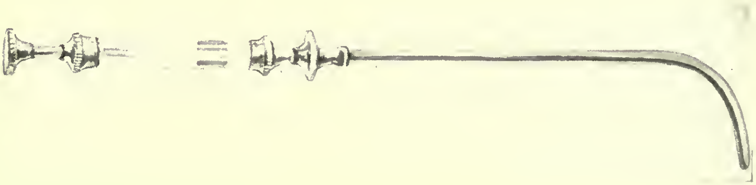

Fig. 29.—Keyes' instillator.

In the absence of gonococci the discharge is either mucous or contains one or several other pyogenic bacteria. This condition will be considered under the caption of Non-gonorrheal Urethritis.

The mucous discharge has its origin in the urethral glands, either diffusely distributed or in the crypts of Morgagni, the utricle, prostate, or seminal vesicles.

To rationally manage any of these urethral conditions the endoscope must be used both for diagnosis and treatment. Any localized areas of granulation, hyperemia, or erosion should be touched with nitrate of silver, beginning with 10 per cent., and increasing to 25 per cent., or the pure stick, carried in small molds made especially for this purpose and used with the Young porte caustique, may also be employed (Fig. 30). Should the mucous membrane show extensive change it is better to give instillations of $\frac{1}{4}$ to 1 per cent. nitrate of silver and massage the urethra gently, holding the nitrate in the canal for two or three minutes.

For gaping, inflamed Littré glands and for any involvement of the utricle, injections are made with the Geraghty syringe (Fig. 31). Nitrate of silver is used in a strength of 1 to 3 per cent. This treatment should be repeated about twice a week. In the interim astringent injections should be used twice daily.

Fig. 30.—Young porte caustique.

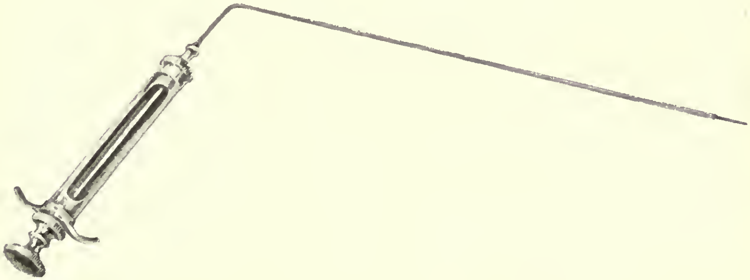

Fig. 31.—Geraghty's utricle syringe with catheter.

A little practice with the endoscope will make its manipulation comparatively simple. The operator should first familiarize himself with the structures of the normal urethra. He will then recognize the pathology as described (Fig. 32).

After eliminating the urethral structures as the source of the continued discharge, the condition of the prostate and seminal vesicles is investigated. Their care is considered later.

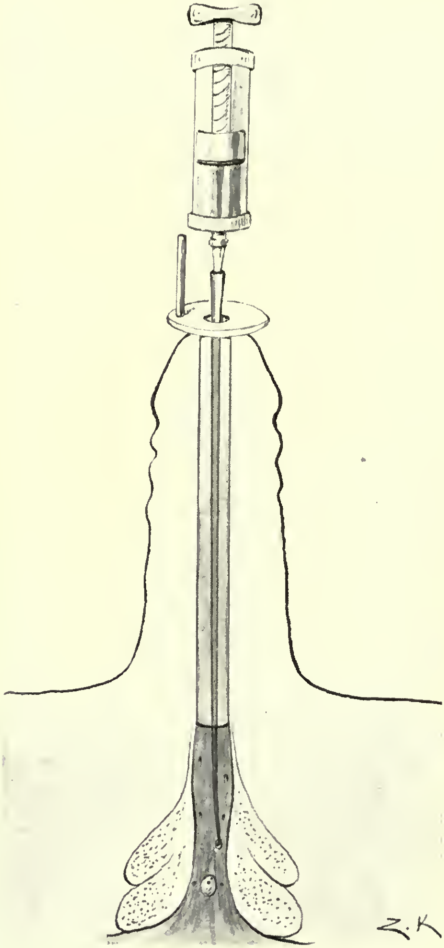

Fig. 32.—Injection of a Littré gland by means of the Geraghty syringe.

Attention should now be turned to the condition of the urine. Pus shreds mean an active exfoliation of the mucous membrane and call for treatment as long as they are present. The passage of sounds followed by instillations of nitrate of silver, $\frac{1}{4}$ to 1 per cent., and massage of the urethra, is the program to be carried out. This should be done twice weekly until the shreds disappear. It is not necessary to use a very large instrument, a No. 24 to 25 French is large enough. It should, of course, be passed back to the posterior urethra, as should also the instillation which is made with the Keyes or Guyon catheter.

After all this detail we are forced to admit that there are a certain number of cases in which, in spite of every effort to eliminate the mucous discharge ("morning drop," "glued meatus"), we fail.

If, however, the urine has been free from pus and repeated examination of the discharge shows no gonococci, there is no need for any further treatment.

It is very difficult to convince a patient of this, and he will often wander from physician to charlatan, hoping to free himself of his "unclean condition," as he expresses it. Such a condition is analogous to that of the nose in the morning, when it requires removal of the mucus accumulated during the night. It must be remembered, however, that advice to stop treatment should be given only in the event that the *urine is free from pus shreds.*

One final consideration is to advise the occasional passage of a sound to avoid the possible formation of a stricture. This should be done once every two or three months for a period of one year. Marriage should be positively forbidden inside the time limit prescribed under prognosis.

PHIMOSIS

The patient should always be advised to undergo circumcision if the prepuce cannot be easily retracted to the corona.

Phimosis (Fig. 33) and balanitis as complications of gonorrhea are rarely seen in private practice. They are always the result of neglect and uncleanliness.

To relieve an inflamed prepuce, irrigations with any mild hot antiseptic solution are advised. A hard-rubber bladder syringe is the best to use, as the tip can easily be inserted between the glans and the mucous membrane of the prepuce. In addition, the penis should be immersed in hot water for ten to twenty minutes every hour or two. As soon as the acute infection has subsided circumcision should be performed.

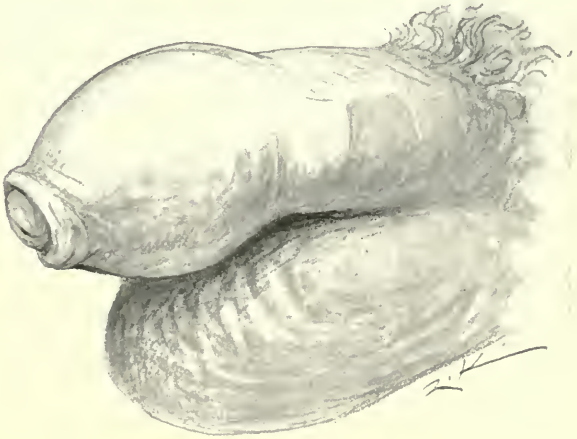

Fig. 33.—Phimosis.

PARAPHIMOSIS

This condition (Fig. 34), arising during the acute gonorrheal infection, may be caused by drawing the foreskin back over the glans for the sake of cleanliness. On account of the tightness, secondary edema occurs and the reduction cannot then be accomplished.

Immersing in hot water often reduces the swelling so that the foreskin may be drawn down. Occasionally the edema increases to such an extent that the skin will become gangrenous. This is due to interference with the circulation. The condition should be met at once by dorsal incision, performed under local anesthesia. Subsequently, circumcision should be done.

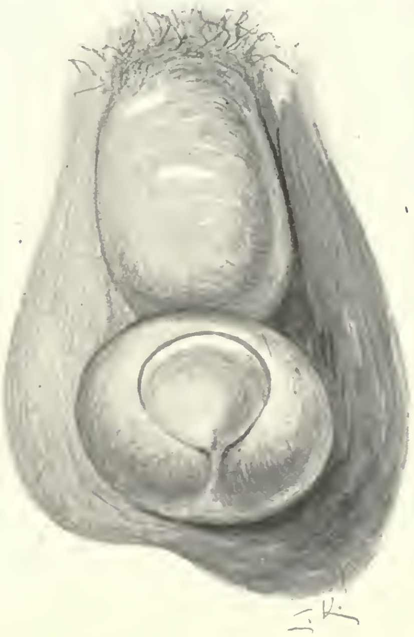

Fig. 34.—Paraphimosis.

PERI-URETHRITIS

This complication, fortunately not of frequent occurrence, may be followed by very aggravating sequelæ. Virulent types of infection, lower resistance, and neglected cases produce the condition.

The **pathology** is varied in its manifestations. It may be limited to marked edema and lymphangitis of the skin of the penis. The spongy portion alone or the cavernous portion may be involved. Abscesses may form and point either extra- or intra-urethrally, followed by fistulæ, which rarely heal spontaneously. Connective-tissue deposits, often very pronounced, form in either the spongy or cavernous portion, producing deformities of the penis, more marked, of course, during erection.

The **treatment** of peri-urethritis should be begun early and vigorously if any of the more serious results are to be avoided. The patient should be at absolute rest in bed; hot boric fomentations should be kept up continuously. The heat is as important as the moisture. All urethral injections must be discontinued. Opium and belladonna suppositories are used to keep down the erections, which are very painful and harmful. The application of ice may be more effective for this purpose, but it will be found less helpful for continuous treatment than moist heat.

The internal administration of drugs is worthless for controlling the priapism.

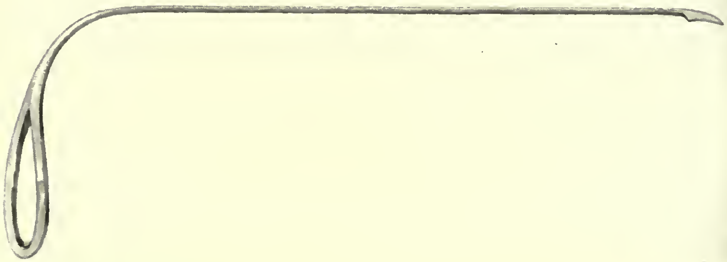

Fig. 35.—Intra-urethral scalpel.

As soon as there is any evidence of abscess formation, incision and drainage should be done. If there is any chance of evacuating the pus per urethra, it is far better to do so, inasmuch as an intra-urethral fistula is less troublesome than an extra-urethral one.

Under 2 per cent. beta-eucain anesthesia a No. 22 or 24 Squier endoscope is carefully introduced, down to the location of the abscess. A generous incision is made with a knife of the type represented here (Fig. 35). Gentle pressure is then made over the lower end of the urethra in order to press out the greater part of the pus.

The fomentations are continued and about twice weekly the urethra is explored to ascertain if drainage is still in progress. The opening should be renewed as often as indicated, always at the same point.

If the fistula persists after four to six weeks a small quantity of nitrate of silver can be used. It should be injected with a Geraghty syringe in the hope of inducing closure.

Plastic operations for the closure of these external urethral fistulæ are probably the most unsatisfactory in surgery. That which may seem to be a beautiful piece of work while your patient is still under anesthesia will give the most discouraging final results. Invariably the stitches will pull out, on account of subsequent priapism, which cannot be controlled. In many cases the final result will be worse than the condition before operation. A good rule to follow is to leave external urethral fistulæ religiously alone.

Little can be done to correct deformities of the penis produced by scar-tissue formation. Fibrolysin or thiosinamin may be tried, but they rarely accomplish anything. Fibrolysin, put up in ampules by Parke, Davis & Company, is used for intravenous injection. Thiosinamin is useful in doses of 0.3 gm.

LYMPHANGITIS AND ADENITIS

Rest and fomentations will usually relieve this condition. Painting of the area involved either with tincture of iodin or pure ichthyol may be tried.

Simple gonococcal enlargements of the inguinal lymph-nodes never suppurate. Occasionally a mixed infection will produce a bubo which requires incision and drainage. No attempt should ever be made to dissect out the glands. It is a dangerous undertaking and may produce a thrombophlebitis or subsequent gangrene.

Make a large crucial incision under general anesthesia, preferably nitrous oxid, swab the cavity with tincture of iodin, and pack lightly with iodoform or any other antiseptic gauze, thus allowing granulations from the bottom upward.

COWPERITIS

Gonorrheal involvement of Cowper's gland occurs by direct extension of the infection through its ducts, which open just behind the bulbous portion of the urethra. As a rule, it develops in the third or fourth week of the disease, but has been noted as early as the second day. It is usually unilateral and more often on the left side, probably because the left gland duct opens slightly further forward.

The onset is usually sudden, with severe lancinating pain in the region of the bulb, which may be referred upward to the large intestine, simulating an appendiceal involvement. Any movement which causes tension on the "hamstring" muscles increases the pain. Slight elevation of temperature is usually present. There is no urinary disturbance. Upon palpation a round, exquisitely tender swelling is felt just behind the bulb of the urethra. The size attained by the enlargement is variable and may reach that of a small orange.

In neglected cases the abscess will rupture either externally or intra-urethrally, leaving a fistula in the latter instance, which, as a rule, eventually heals. The pus may burrow upward in the region between the bulb and the transverse perineal muscles.

In the acute stage rest in bed and the application of heat or cold is indicated. As soon as fluctuation is noted, incision and drainage should be done, great care being taken not to enter the urethra or injure the bulb.

EPIDIDYMITIS

The extension of a gonorrheal infection from the posterior urethra along the vas deferens to the epididymis, in proportion to the frequency of the disease, is relatively uncommon. It occurs in about 10 per cent. of the cases of posterior involvement.

The spread of the disease is by direct extension through practically all of the ducts. Secondary swelling and edema occur, miliary abscesses forming, extending outward to the supporting tissue which holds the convolutions of the epididymis together, but never extending inward past the tunica albuginea or involving the testicle. Instead of the miliary abscesses, there may be a generalized brawny infiltration with exudation into the sac of the tunica vaginalis, thus producing an infected hydrocele, often of considerable proportions. The exudate and infiltration frequently spread upward as far as the internal abdominal ring.

Secondary infection may complicate the picture, thus intensifying the process, and even spreading into the tubules of the testicle. This is a rare complication, though its possibilities and portent must be borne in mind.

The **symptomatology** is typical and clear. There are pain, tenderness, and swelling usually in the left scrotum. The symptoms rapidly increase in intensity and usually reach their height in twenty-four to thirty-six hours. The infection is unilateral in about 95 per cent. of the cases. The pain is usually excruciating and is referred upward along the cord. It may be spasmodic, due to the involuntary contraction of the cremasteric muscle-fibers. Nausea and vomiting may be associated with the pain and the tenderness may extend upward as high as the lower quadrant of the abdomen, and, associated with some elevation of temperature, may present a picture closely simulating an acute intra-abdominal infection, especially appendicitis.

The acute attack may last from two to fourteen days. Treatment promptly instituted will, in the majority of cases, ameliorate the subjective symptoms in from forty-eight to seventy-two hours. Acute exacerbations may occur three to six months after the initial attack.

A usual manifestation at the onset of the acute process is the sudden and complete cessation of the urethral discharge, together with the clearing of the urine. The discharge is invariably reestablished when the inflammation and swelling of the epididymis subside.

Treatment.—A great deal can be done to obviate involvement of the epididymi during the course of an acute posterior urethritis. Rest in bed and strict avoidance of any exercise or motion that is liable to force gonococci into the ejaculatory ducts are most valuable prophylactic measures. Motoring and running are two forms of exertion to be avoided. Should the patient remain ambulatory a suspensory must be worn.

The active, conservative treatment consists in absolute rest in bed, support of the scrotum, and continuous hot fomentations, which are more soothing than ice, even during the summer months. It may be necessary to give morphin hypodermically to relieve the pain; as a rule, however, opium in rectal suppositories will suffice. Catharsis is necessary to counteract the constipating effects of the opium.

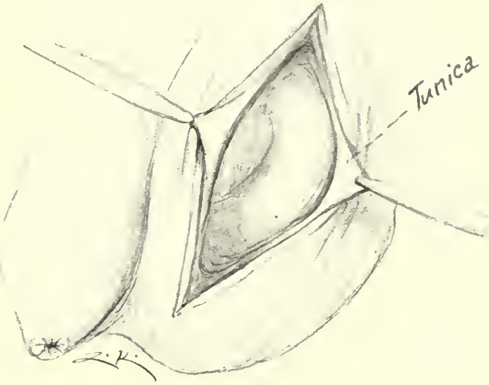

Fig. 36.—Incision through the skin and tunica vaginalis, thus exposing the epididymis.

The surgical treatment is either the Belfield operation (vasotomy), or the Hagner operation (epididymotomy), or the two in combination.

The rationale of the surgical interference is drainage and the relief of pressure. The indications for epididymotomy are continued pain for more than seventy-two hours. By the relief of pressure there is a better chance of the lumen of the vas remaining patent. Recurrences also call for operation.

The author does not feel that vasotomy alone could ever give as much drainage as this operation in combination with epididymotomy.

The technic of *epididymotomy* (Figs. 36 to 39) is as follows: Nitrous oxid anesthesia is always preferred. An incision about 10 cm. in length is made into the scrotum posterolaterally, over the epididymis. The fasciæ are cut through and prompt hemostasis carried out. If there is a hydrocele present, the contents of the infected side of the scrotum are delivered and a typical hydrocele operation performed. The tunica vaginalis is incised and inverted and one or two loosely tied catgut sutures hold back the inverted edges. If no hydrocele is present, then the tunica is carefully incised over the entire length of the epididymis.

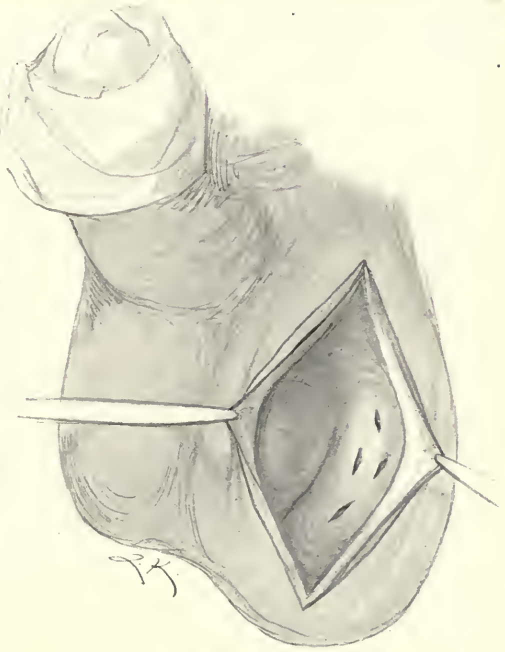

Fig. 37.—Multiple superficial stabs made into the epididymis. These small incisions should be made parallel to the longitudinal axis of the gland.

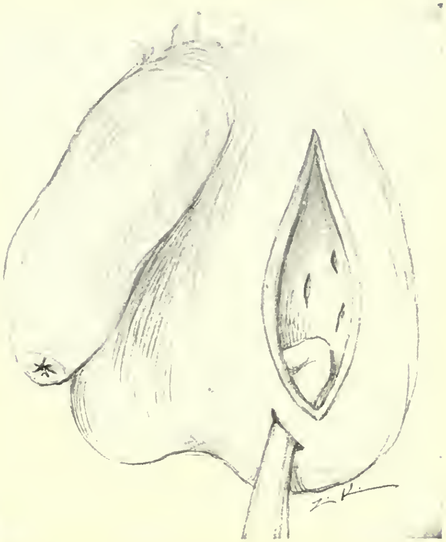

Fig. 38.—Gutta-percha drain placed at lower angle of the incision within the tunica and brought out at a counterpuncture through the scrotum below the incision.

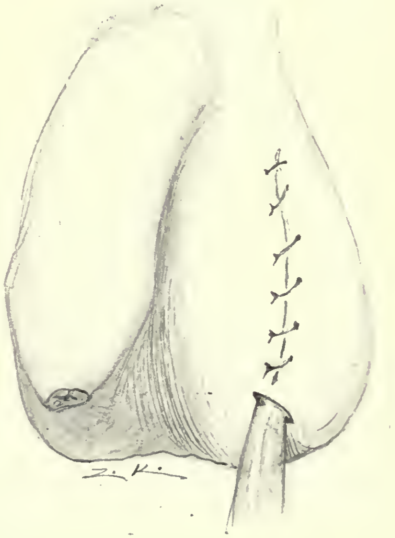

Fig. 39.—Closure of the skin with continuous catgut suture.

If present, any projecting tubercles or miliary abscesses are punctured; then half a dozen punctures are made along the surface of the epididymis. These should not penetrate to a depth of more than 10 or 15 mm., as they serve only to relieve the tension. Deeper punctures will sever the tubules. A small piece of gutta-percha is placed in the lower angle of the incision and both fascia and skin are closed with two layers of continuous plain catgut. The scrotum is supported and the drain removed in two or three days.

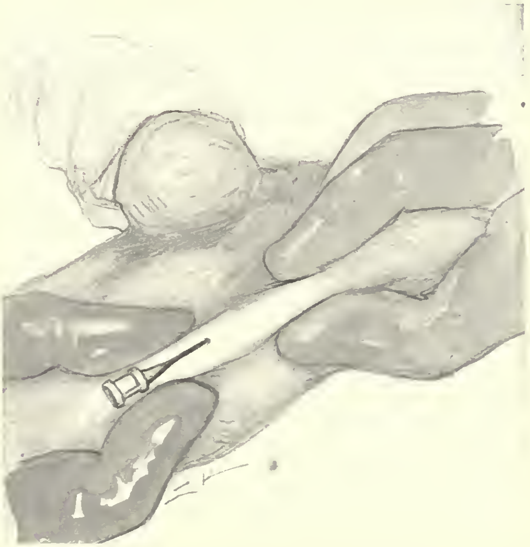

Fig. 40.—The spermatic cord is grasped and held firmly subcutaneously—a small quantity of 1 per cent. novocain is injected along the line of the proposed incision which should be just at the beginning of the pendulous scrotum or 12 cm. below the external abdominal ring.

As a rule, it is not necessary to continue the fomentations after the operation. The patient will be immediately relieved of pain and may be allowed to get up on the third to the fifth day.

Vasotomy (Figs. 41 to 49), if performed alone, should always be done under local anesthesia. Two per cent. novocain or 2 per cent. beta-eucain is used for infiltration. The ease with

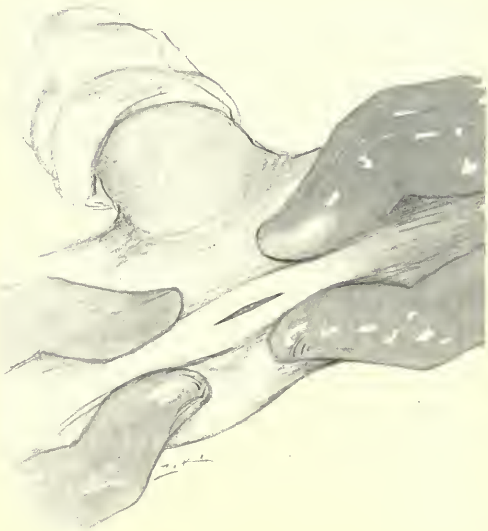

Fig. 41.—Incision through the skin.

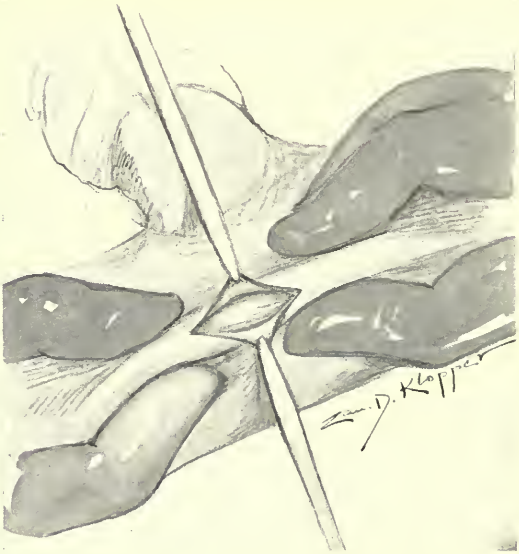

Fig. 42.—The cord exposed to view.

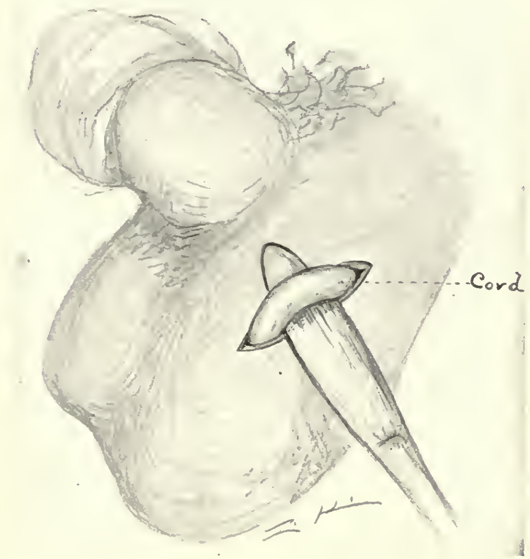

Fig. 43.—The cord lifted out of the scrotum upon a Kocher director.

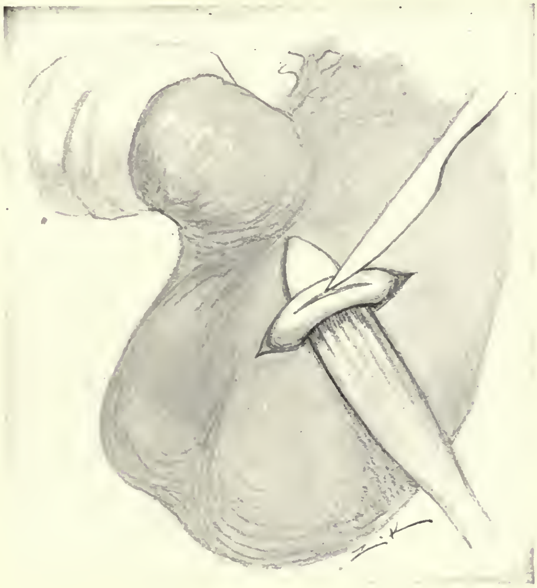

Fig. 44.—Incision into sheath of the cord.

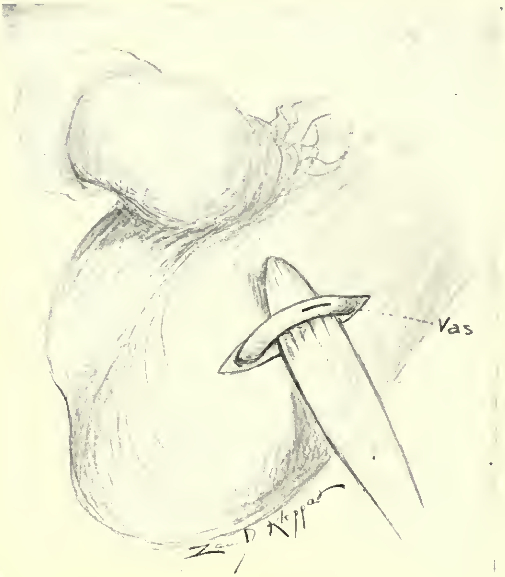

Fig. 45.—The vas separated from the other spermatic structures and raised upon a Kocher director. Incision into the vas about 1½ cm. long.

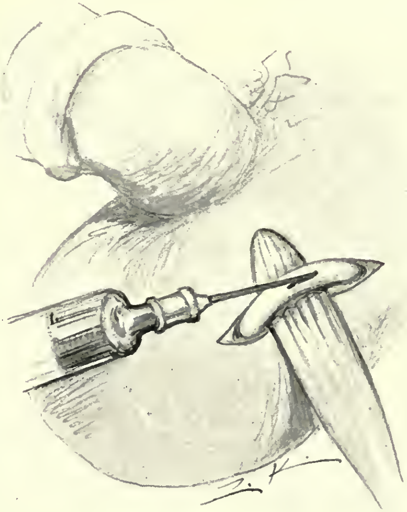

Fig. 46.—With a blunt needle the vas is injected toward the seminal vesicle.

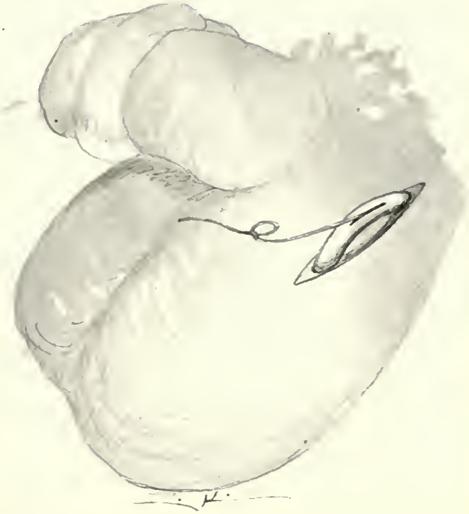

Fig. 47.—A silkworm-gut drain is inserted toward the vesicle—a distance of about 8 cm.

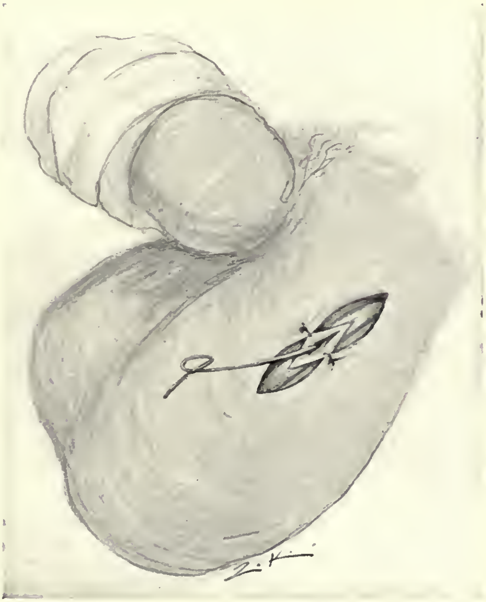

Fig. 48.—Method of keeping the vas open for subsequent injections.

which this operation is performed depends upon correctness and firmness in holding the vas, which should be separated from the other structures of the cord subcutaneously by digital manipulation. A cut about 5 cm. in length is made at about the beginning of the pendulous scrotum. The fascial layers of the skin and cord are carefully dissected until the vas, which is easily recognized, comes into view. A Kocher dissector is then inserted beneath the vas and the other structures are released. With a very fine and sharp scalpel an incision 0.5 cm. in length is made into the vas until the lumen is recognized by the glistening mucous membrane. Great care must be exercised in incising the duct. It has a tendency to roll away from the tip of the knife and there is danger either of cutting across it or cutting through the posterior wall. If the assistant will make firm pressure upon the vas, both above and below the point where the incision is to be made, it will greatly facilitate the operation.

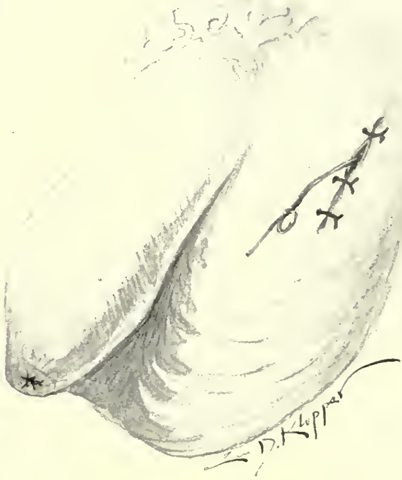

Fig. 49.—Incision closed, with silkworm-gut drain left in the vas.

After the vas is incised it should be injected with 4 or 5 c.c.

of either 20 per cent. argyrol or collargol. The injection is made with the Luer or Record syringe, the needle of which has been filed quite blunt, so as to simplify the procedure. A sharply pointed needle may catch in the mucous membrane.

The injection, of course, is made toward the seminal vesicle. The subsequent urination is colored, showing the patency of the ejaculatory duct.

The vas should now be treated in one of two ways. First, a piece of silkworm-gut 25 to 30 cm. long is inserted into the lumen of the vas toward the seminal vesicle. This acts as a drain, keeping the vas open and giving drainage also from the epididymi. A piece of gutta-percha should be passed under the vas and either end of the incision closed with a single catgut suture. Subsequent injections are made by gently pulling the vas upward by the two ends of the piece of gutta-percha, which is used as a support.

The other way to treat the duct is to pass a fine catgut suture through either side of the incised vas and fix it to the skin. Subsequent injections are more easily made and with less discomfort to the patient. The drain may be removed and reinserted at each injection. Closure of the vas occurs a few days after permanent removal of the drainage and release of the skin sutures. It is interesting to note that according to the extensive reports of Belfield and Herbst no case of vasotomy has ever resulted in stricture.

PROSTATITIS

The conditions which invite an invasion of the prostate during a gonorrheal infection are about the same as those mentioned under the etiology of posterior urethritis. In addition, constipation should be included as an important factor.

The prostate gland is always involved when the infection spreads to the posterior urethra. Gonorrheal inflammation of the prostate is, therefore, a relative condition. We may speak of an acute prostatitis when the condition is marked enough to produce severe subjective symptoms.

The gland may be infected only in the immediate vicinity of the urethra, when there are usually few if any symptoms definitely referred to the prostate itself. If there is a more extensive involvement the gland becomes enlarged in direct ratio to the virulence of the invading organism. This may vary from the size of an English walnut to that of a large orange.

The process involves both the interstitial and glandular elements. Miliary abscesses form which may coalesce and form one large abscess. This may drain spontaneously into the urethra and completely empty itself, or it may rupture into the bladder or rectum.

The pathologic picture may be that of a subacute or chronic inflammation. It may run a very prolonged course which may ultimately result in secondary contraction of the glandular element and obstruction of the urethra. Another sequela may be the so-called prostatic bar of Young, which also will cause urinary obstruction.

Symptoms.—The pain associated with acute prostatitis is proportionate to the degree of enlargement of the gland. It is always located in the perineum and may be excruciating, increasing at the end of urination and during defecation. The pain may be referred along the course of the sciatic nerve or to the scrotum and penis. The sitting posture increases the discomfort, as does any pressure upon the perineum.

Digital examination per rectum reveals the enlarged tender gland, which if suppurating will give fluctuation.

In the acute form there is always an accompanying systemic reaction, with malaise, chills, and temperature ranging from 100° to 103° F. The picture is that of mild sepsis.

The urinary disturbances vary from dysuria and frequency to complete retention, depending upon the degree of enlargement of the gland and obstruction at the internal urethral orifice. The third glass test is always turbid.

The *subacute* and *chronic types* are represented by the sensation of suprapubic discomfort, or "a sensation of weight" over the bladder. There is usually painful orgasm, which destroys the libido, with a resulting impotency.

The gland is more or less tender to the examining finger in the rectum.

There is usually frequency of urination, though there may be only slight discomfort instead of painful micturition.

Treatment.—Absolute rest in bed in the prone position is indicated in acute prostatitis. The sitting posture produces pressure upon the perineum and is painful and harmful.

Very hot sitz-baths every two hours, ten to fifteen minutes in duration, are recommended. If the prostate is not too sensitive, irrigation with large quantities of hot water every two to three hours will give quicker results. The method recommended is shown in Fig. 50.

For the pain and vesical tenesmus, ichthyol, opium, and belladonna rectal suppositories should be given freely. Great care, however, should be taken not to produce constipation.

The acute symptoms subside in from one to two weeks. The prostate is then ready for massage. Massage should never be attempted during the acute stage. If upon introducing the finger into the rectum the patient complains of pain, desist for a few days longer. The massage should be begun gently, avoiding brutality, though firm pressure may be made subsequently. The gloved index-finger is carried to the apex of the gland at either border and stripped downward, moving the finger slowly toward the opposite border until the entire area of the prostate has been covered. This may be repeated two to three times. The patient should have a bladder full of urine, sufficient having been previously voided to wash out the urethra. The remainder may be passed at the end of the massage, to carry away any material pressed into the prostatic urethra and act as a natural irrigation.

The massage should be done two to three times weekly and continued as long as any pus or detritus is expressed from the gland. This is determined by the appearance of the urine voided after massage.

The question of deep instillations of nitrate of silver is a much mooted one. It is surely unwise to use it if gonococci can be demonstrated either in the discharge or prostatic excretion.

It is doubtful if the nitrate ever aids the healing of an inflamed prostate. We have but to consider the anatomy of the prostate in the region of the posterior urethra. Ten to fifteen small ducts leading from the convoluted glands to the urethra will scarcely take up any of the nitrate, with its astringent properties.

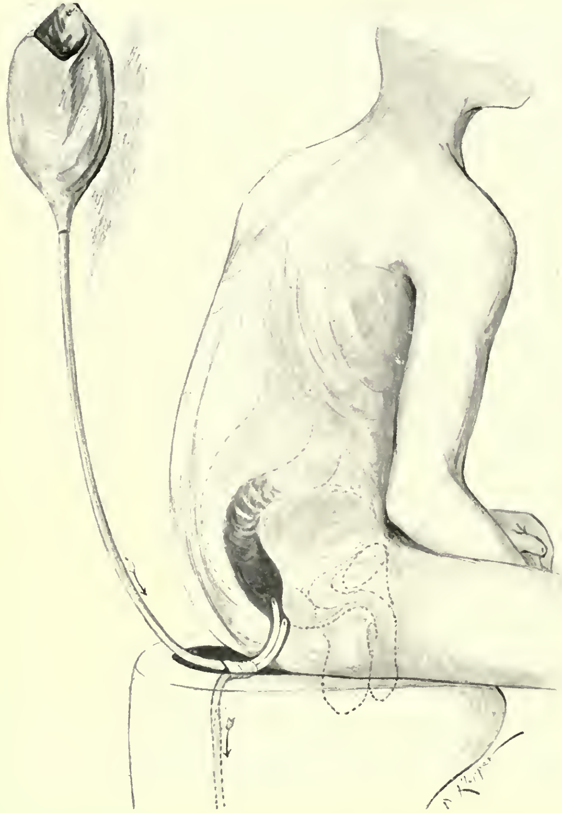

Fig. 50.—Author's method for irrigating the prostate. Two No. 14 French soft-rubber catheters are held together by adhesive tape about 10 cm. from the eyes of the catheters. One is connected with an irrigator, or an ordinary enema bag, the other hangs down into the toilet upon which the patient is seated. The two ends of the catheters are inserted just past the sphincter ani muscle. The water should be 110° F. The flow is indicated by the arrows; 3 to 4 liters of water should be used for each irrigation.

Nevertheless, the instillation of $\frac{1}{4}$ to 1 per cent. will do no harm and may be used following micturition after massage.

Prostatic Abscess.—It is often very difficult to decide just what to do in prostatic abscess. One's best judgment is always put to the test.

A large fluctuating abscess with marked septic symptoms should be opened and drained without any delay.

In the absence of systemic involvement or any great amount of pain, deliberation is permissible. It should always be remembered that there is a chance of spontaneous rupture into the bladder or rectum, which is usually followed by most unpleasant sequelæ. A prostatorectal fistula rarely heals, even after surgical interference. A prostatovesical fistula gives trouble for years and rarely can be influenced by surgery.

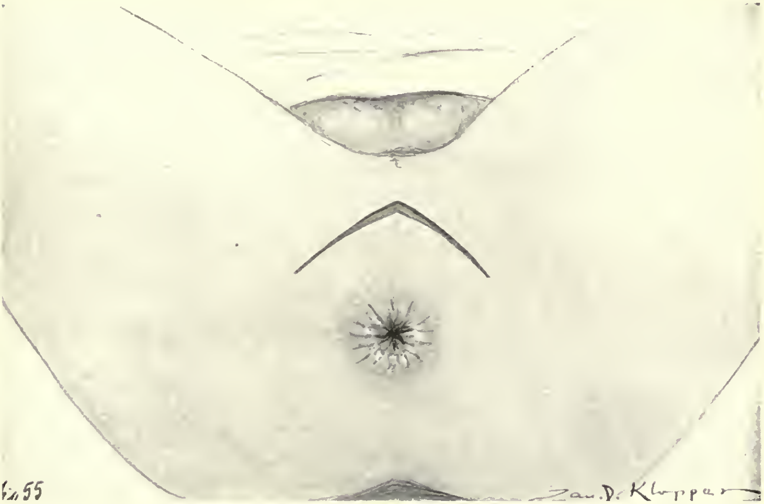
Fig. 51.—Inverted V-shaped incision made just above the anus.

It behooves the genito-urinary surgeon, therefore, to advise incision and drainage in every pronounced case. If spontaneous evacuation per urethra occurs, both patient and surgeon are fortunate. It is impossible to tell, however, when this will take place.

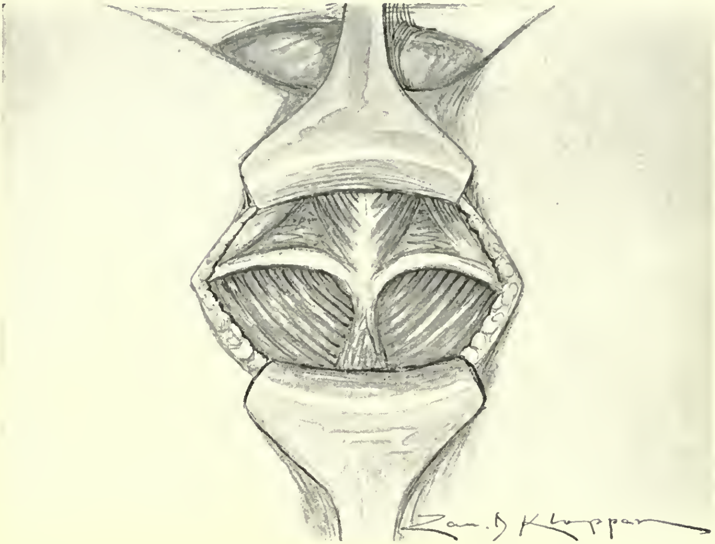

Fig. 52.—The skin reflected downward, great care being taken to preserve the central perineal tendon.

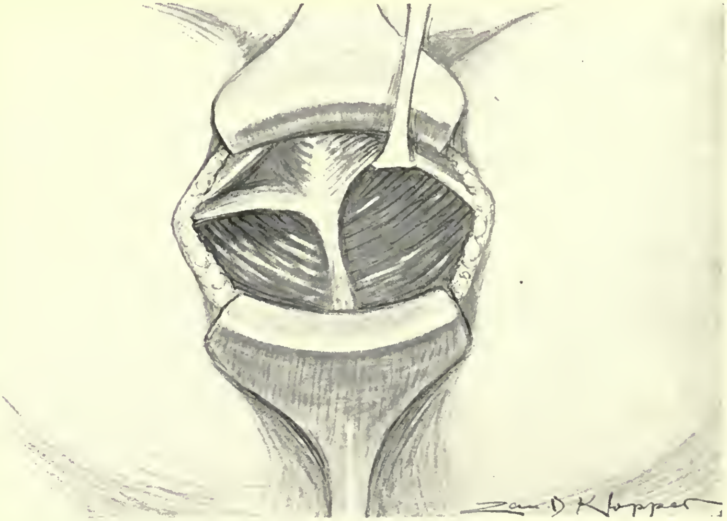

Fig. 53.—The transverse perineal muscle retracted upward.

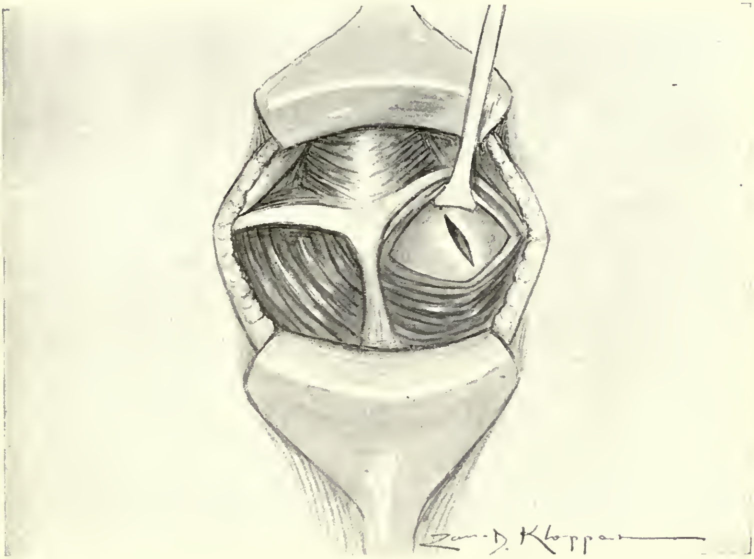

Fig. 54.—Separation of the fibers of the levator ani muscle, bringing into view the bulging prostate, which is incised.

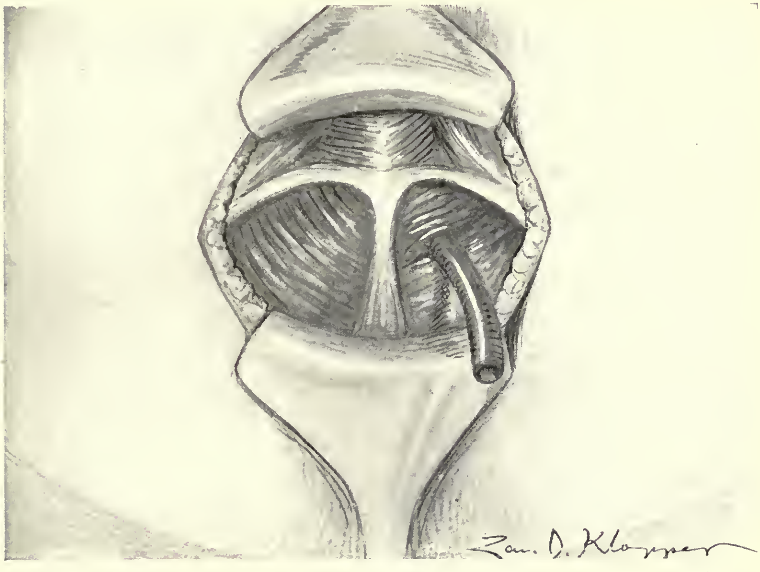

Fig. 55.—Medium-sized rubber drainage-tube fixed by a chromic gut suture which should be kept *in situ* until no further pus is evacuated. This may require three to five weeks.

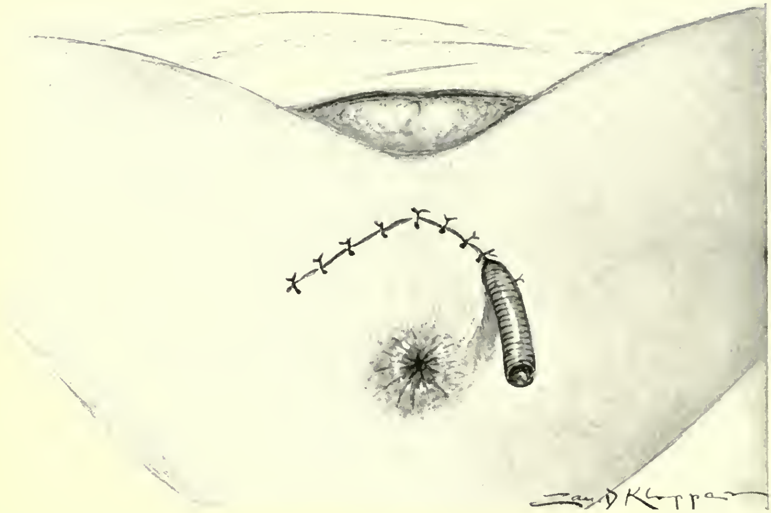

Fig. 56.—Closure of incision with interrupted silkworm-gut.

The technic for draining a prostatic abscess through the perineum is illustrated by Figs. 51 to 56.

SEMINAL VESICULITIS

Inasmuch as the fascial capsule of the seminal vesicles is a reflection of the prostatic sheath, it is impossible to have a prostatitis without involvement of the vesicles.

As with the prostate, there is marked variation in the extent of infection. The vesicles may be greatly enlarged or only slightly so. Abscess formation is unknown, though accumulations of pus, which may be evacuated by stripping with the finger, are of frequent occurrence.

In the chronically inflamed state they are often very little larger than normal, though much inflammatory material may be expressed from them.

The **symptomatology** of the acute stage is practically the same and always associated with acute prostatitis.

When the acute inflammation has become chronic the prostate is usually restored to normal long before the vesicles. The most prominent symptoms of chronic seminal vesiculitis are terminal dysuria, never severe but very annoying; painful orgasm, often tinging the semen with blood and producing impotence by destroying the libido; and pyuria, or pus in the third glass test.

The treatment of acute vesiculitis is the same as that of acute prostatitis. For the chronic form, massage of the vesicles together with rectal suppositories of ichthyol and extract of belladonna and hot sitz-baths should regularly be given.

Associated with, or as a sequel to, chronic seminal vesiculitis are various types of arthritides. These joint involvements are usually called gonorrheal, but recent study of the bacteria from the vesicles show that the gonococci cannot be recovered, though the symptoms relative to the joint are identical with the typical gonorrheal variety.

Vasotomy has for some years been highly recommended as curative by such reliable urologists as Belfield and Herbst. At the present time vesiculotomy and vesiculectomy are in vogue for the relief of the joint infection, but it is too soon to draw any definite conclusion as to the permanency and percentage of cures.

Further than making this generalization, this work will not take up a consideration of these procedures.

CHAPTER VIII

STRICTURE OF THE URETHRA

A CLASSIFICATION of strictures of the urethra may be considered under the following captions:

I. *Anatomic:*

1. The anterior urethra:
    - (*a*) The navicular portion.
    - (*b*) The penile portion.
    - (*c*) The bulbous portion.

It is more common at this (bulbous) location than at any other site, owing to the rich blood and lymph supply. The navicular area is next in frequency and the penile portion is least often affected.

2. The posterior urethra:
    - (*a*) The membranous portion is only affected by stricture of traumatic or congenital origin. It is the seat of traumatic rupture, which usually results in a narrowing unless promptly and well repaired.
    - (*b*) The prostatic urethra may be narrowed by an inflammatory stricture, but less often than at the other location mentioned. Narrowing in this locality must be differentiated from contracture of the vesical neck and the so-called "bar formation."

II. *Pathologic:*

1. According to the direction of formation:
    - (*A*) The annular type where the scar encircles the entire circumference of the lumen (Fig. 57).
    - (*B*) Irregular, where the outline may traverse part of the circumference of the urethra, then extending either distally or proximally before completing its extension around the urethral lumen (Fig. 58).
    - (*C*) Nodular where the lumen is obstructed by two or more scar contractions each formed independently of the other.

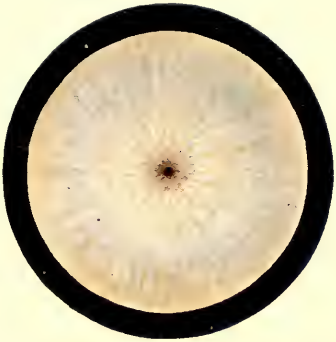

Fig. 57.

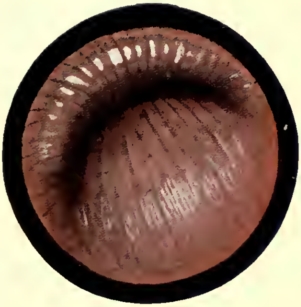

Fig. 58.

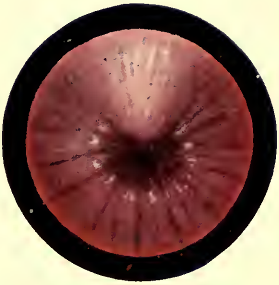

Fig. 59.

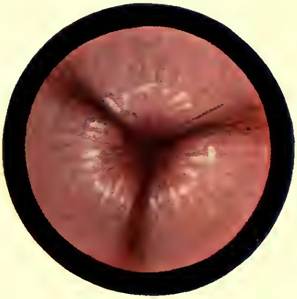

Fig. 60.

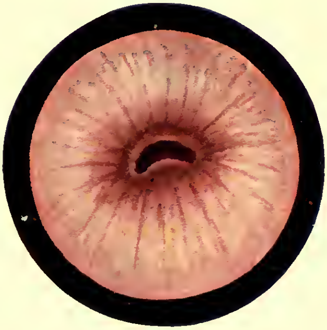

Fig. 61.

Fig. 57.—Annular stricture of the indurated variety. Bulbous portion. Note the pronounced anemia, due to extensive scar-tissue formation.

Fig. 58.—"Irregular" stricture.

Fig. 59.—Soft stricture. Some edema of the mucous membrane of upper wall.

Fig. 60.—Soft stricture presenting different contour. Midpendulous urethra. Bleeds profusely upon instrumentation.

Fig. 61.—Resilient stricture.

2. According to the consistency:
    (*A*) The soft or granular variety is represented by a high degree of granulation formation before secondary contraction. The granulations are soft, bleed profusely and easily, and yield promptly to treatment (Figs. 59 and 60).
    (*B*) The resilient is a more advanced stage of the granular type. Connective tissue has formed and some contraction has occurred. This variety responds to dilatation, as a rule, but less readily (Fig. 61).
    (*C*) The indurated stricture is the most advanced variety, the scar tissue being fully formed. It is characterized by a sensation of "wooden hardness" to any instrumentation. This type is the one that most often requires surgical intervention.
3. According to degree:
    By this is meant the extent of obstruction in the urethra. The infiltrating type produces the greatest narrowing, usually admitting only a filiform, providing the opening can be found.

III. *Clinical:*

1. The spasmodic stricture is purely symptomatic and responds readily to removal of the cause.
2. Organic:
    (*A*) A congenital stricture is due to some embryologic malformation. It may be situated at any portion of the urethra, but is more often at either the navicular or the membranous areas.
    (*B*) Acquired:
        (*a*) In inflammatory stricture gonorrheal urethritis is the etiologic factor in about 98 per cent. of the cases. Other factors may be other bacterial urethritides, including tuberculosis, chancroid, and chancre.
        (*b*) Traumatic stricture may be produced by rupture of the urethra and injury produced by sexual abnormalities, such as intra-urethral masturbation with nails, pieces of wire, etc.

The pathologic etiology has been described in the chapter on Pathology of Gonorrhea.

The time required for the formation of a stricture varies from two to ten years, depending upon the severity of the infection and the degree of neglect on the part of the patient or the attending physician, or both.

The Symptoms and Diagnosis.—Difficult urination, frequent urination, and imperfection in the stream form the diagnostic triad of organic stricture.

There is difficulty, usually, in getting the stream started and long-continued dribbling after the bladder seems to have emptied itself.

The nearer the obstruction is located to the internal urethral orifice, the more pronounced is the frequency of urination. The reason is self-evident.

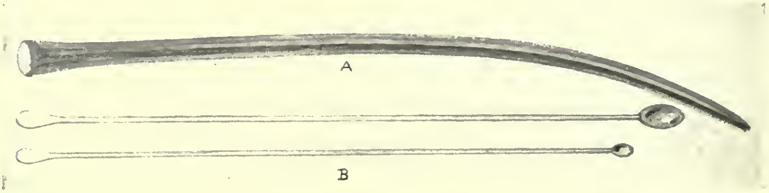

Fig. 63.—*A*, Flexible bougie; *B*, olivary diagnostics.

Imperfections in the flow may vary greatly; the stream may be thread-like or wide, being flattened instead of circular, as in the normal. It may also be split into two or three parts.

Spasmodic obstruction of the urethra is usually characterized by acute retention of urine or spasmodic contraction of the sphincter muscle at the bulbous portion during the course of an acute urethritis. It may also be stimulated by an attempt at urethral or vesical instrumentation, and may also occur after operation for hemorrhoids or hernias.

The diagnosis of organic obstruction is made by consideration of the symptoms and the instrumental findings. Diagnostics (Fig. 63, *B*), bougies à boule (Fig. 63, *A*), sounds (Fig. 64), and the endoscope (Fig. 65) form our armamentarium. Great care and judgment must be used in handling any of these instruments. Serious injury may be produced.

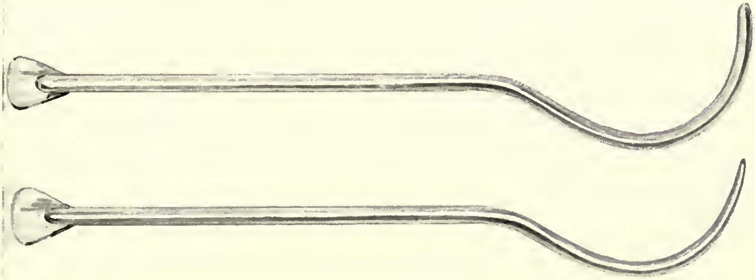

Fig. 64.—Charrière-Béniqué posterior sounds, blunt and conical pointed.

Acute retention of urine during the course of an acute urethritis is always spasmodic and invariably yields to the hot sitz-bath. Instrumentation under such conditions is liable to cause extension of the infection into the ejaculatory ducts or the bladder.

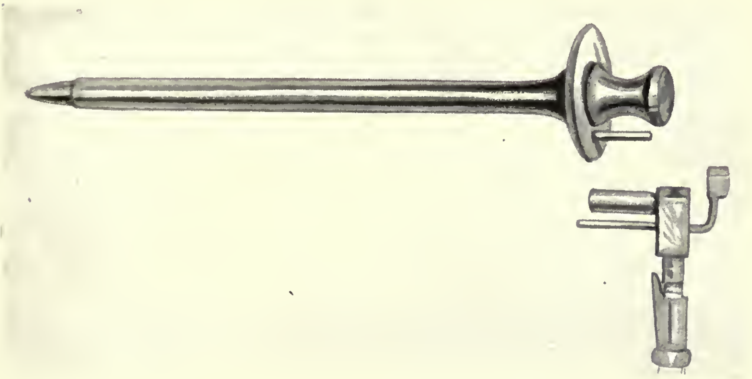

Fig. 65.—Squier endoscope.

Unskilful or brutal instrumentation may traumatize an existing stricture to the extent that acute retention will follow. The production of "false passages" (Fig. 66), from improper introduction of sounds, will cause a great deal of trouble in future attempts at dilatation.

The "olive-tipped" diagnostic may detect a slight variation in the urethral wall when a sound will not, but the endoscope will reveal any deviation from the normal and should always be used in the routine examination.

In reviewing the **prognosis** of organic stricture of the urethra the author has found a unanimity of opinion. Very few can be cured; that is, cured in the sense that the patient may be permanently dismissed from observation. The frequency with which it is necessary to observe a patient depends entirely upon the pathologic type he represents.

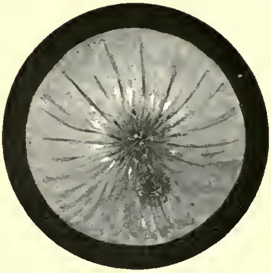

Fig. 66.—False passage in the pendulous portion of the urethra made during an attempt to relieve an acute retention of urine.

Those patients whose strictures have had surgical intervention, as a class, can never be discharged. Sounding will be necessary at intervals varying from three to six months for an indefinite number of years. Failure to carry out this precaution will result almost invariably in recurrence.

Treatment.—The care of spasmodic contraction has been outlined under diagnosis. In addition to the sitz-bath for relief of the retention, rectal suppositories of ichthyol, opium, and belladonna should be administered. Hot rectal irrigations given in the manner previously described (Fig. 50) are also of value.

In contemplating the management of organic urethral obstruction we must consider the presence of two other clinical manifestations which greatly complicate our progress. These are urethritis and prostatitis, both of which may be acute, subacute, or chronic.

We cannot be dogmatic in our procedure under such conditions, but must individualize.

If the gonococcus can be demonstrated in the urethral discharge it is necessary to refrain from using any instrument as long as possible. This may require the watchful waiting of weeks or months.

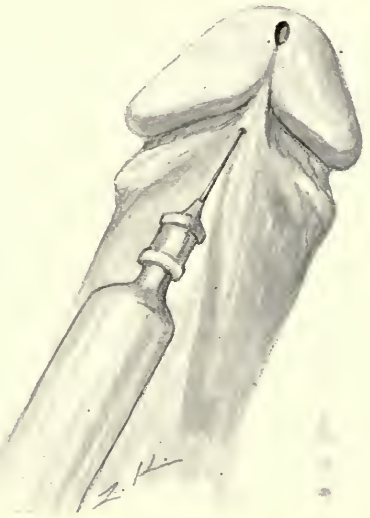

Fig. 67.—Infiltration of the frenulum with 2 per cent. beta-eucain.

The offending prostate may be more readily managed and should be reduced to normal (see chapter on Prostatitis) before proceeding to relief of the stricture.

The author makes a strong appeal for conservative or non-operative management of stricture. Ninety-eight per cent. of all organic strictures may be relieved without the urethrotome or knife.

In many instances great perseverance and endurance are demanded on the part of both patient and physician, but the ultimate results thus obtained are far preferable. The posturethrotomy care of the patient is as long, if not as tedious, as the care without operation, so in the end little is gained.

Gradual Dilatation.—A number of factors must be taken into account before proceeding with instrumentation.

No satisfactory results can be obtained if the meatus is too small to admit the largest size sound. Meatotomy must then be performed. This is accomplished by infiltrating along the frenulum of the glans penis with 2 per cent. beta-eucain or 1 per cent. novocain (Fig. 67). The cut is then made with a small pair of scissors introduced into the meatus (Fig. 68) a distance of about 1 cm., directing the instrument slightly lateral to the median line in an attempt to avoid cutting the artery to the frenulum, as it may be a bit troublesome in ligating (Fig. 69). The mucous membrane of the cut edge is then joined to the skin of the glans on each side by a single fine double 00 catgut suture (Fig. 70). This secures prompt hemostasis and prevents any sub-

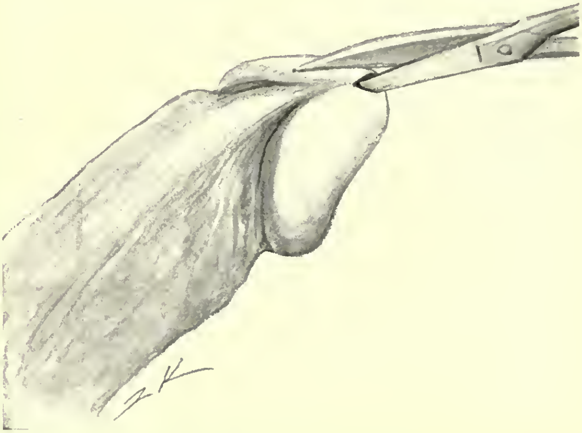

Fig. 68.—Cut from above downward, avoiding the artery to the frenulum by directing the scissors slightly lateralward.

sequent closure of the incision. An interval of a few days should be allowed to elapse before proceeding further.

To obtain the best results local anesthesia should be employed wherever there is the least sensitiveness in the canal. The author has had excellent results with 2 per cent. beta-eucain and has never encountered the least evidence of toxicity. The instillations should be given both posteriorly and anteriorly if it is at all possible for the Guyon catheter to pass the point of obstruction. Five to ten minutes are required to obtain satisfactory anesthesia.

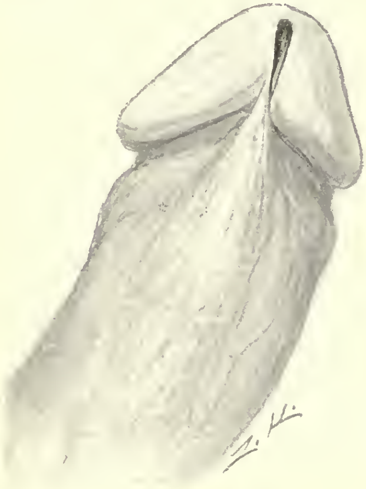

Fig. 69.—Appearance after the cut has been made.

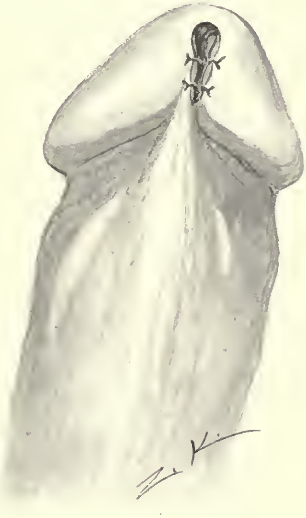

Fig. 70.—The operation completed, showing the placed sutures.

Hemorrhage may often prove to be very troublesome following the introduction of a sound or bougie. This may generally be controlled by the addition of 5 to 10 drops of adrenalin solution 1 : 1000 to the beta-eucain. The possibility of adrenalin idiosyncrasy must always be borne in mind. It presents very alarming symptoms, though no fatality has come to the notice of the writer.

The influence of fibrolysin upon the "infiltrated" type of stricture is often very striking. Fibrolysin was heralded on its discovery as a dissolver of fibrous tissue. It is now known to have no such influence. It does, however, often soften scar tissue. One ampule of fibrolysin (Parke, Davis & Co.) injected intravenously on three successive days will frequently soften a previously impassable stricture so that a fairly large sound will pass without any difficulty. A week to ten days should elapse after the third injection before any attempt at instrumentation is made.

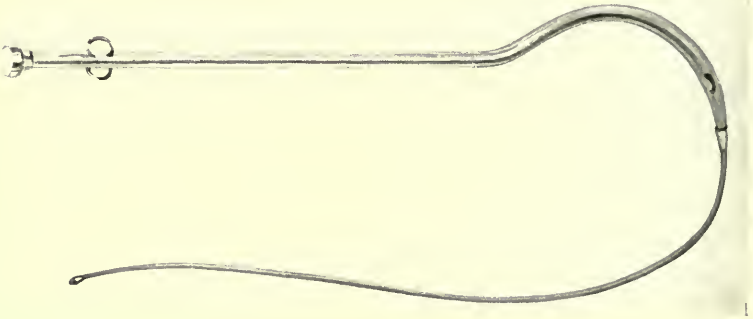

Fig. 71.—Filiform with follower.

The Technic of Instrumentation.—Exploration of the urethra should first be made with the olive-tipped diagnostic (Fig. 63), to ascertain the location of the stricture or strictures. The obstruction is usually multiple. Having located the first point of narrowing in the anterior urethra arbitrarily, a 22 French anterior metal sound (Fig. 64) is passed, if possible. This size is selected, as it represents the normal caliber of the average urethra. Should this size fail to pass, paradoxic though it seems, one may succeed with a larger one. If this attempt is unsuccessful, the filiform (Fig. 71) should next be used. The two methods of instrumentation most commonly employed are: (1) with the endoscope and (2) with multiple filiforms. In the latter method filiforms are introduced until one of them finds the opening;

then all but this latter are withdrawn and the end of the one passed is attached to the follower (Fig. 72), which is then carefully pushed through the urethra into the bladder. Great caution must be observed not to turn or twist the follower for fear of unscrewing it from its filiform.

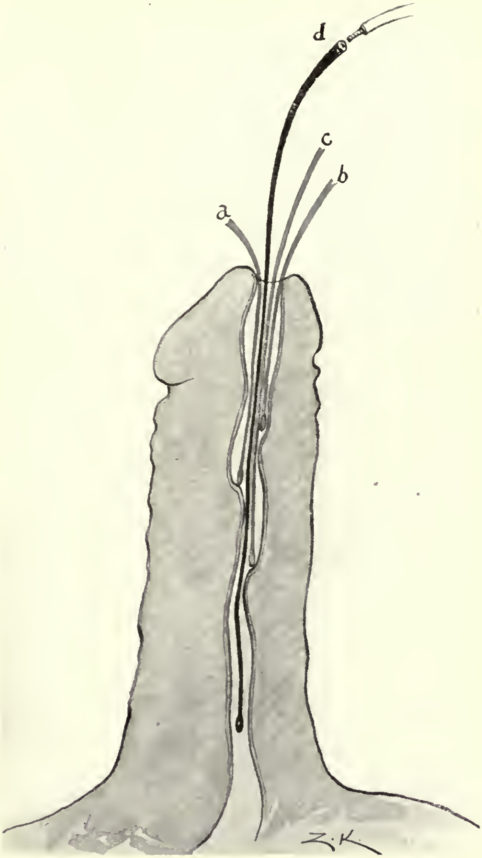

Fig. 72.—Finding the lumen of a strictured urethra with multiple filiforms.

The use of the endoscope to localize the opening in the strictured canal (Fig. 73) is very often of great value and will succeed when other procedures fail.

Should our diagnostics show no obstruction in the pendulous portion, recourse is made to the curved or posterior sound. The

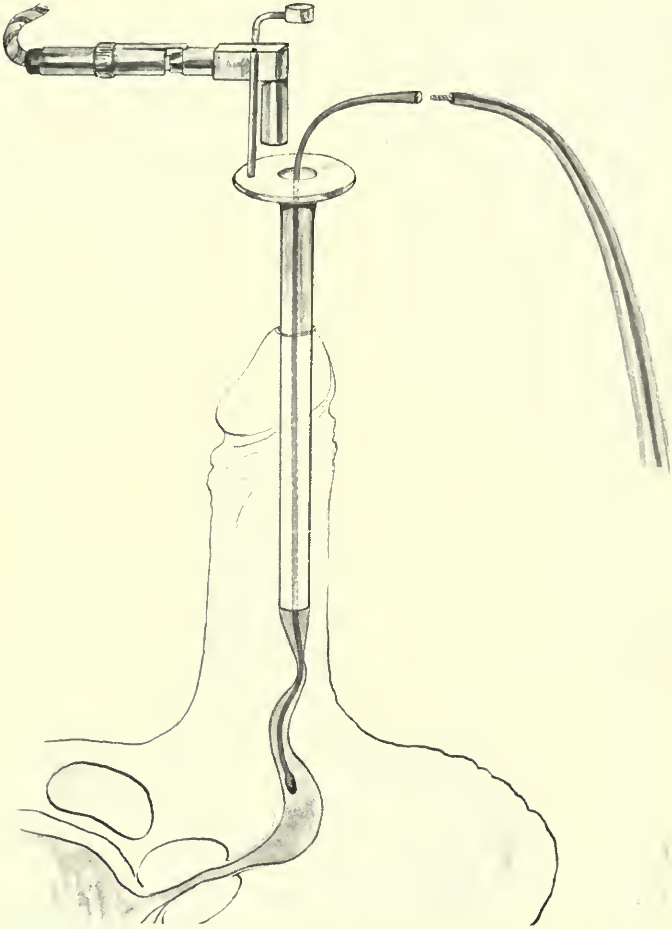

Fig. 73.—Finding the lumen of a strictured urethra with the aid of the urethroscope.

double-curved (Fig. 64) or Charrière-Béniqué instrument is the one of choice. This sound is built upon a rational anatomic basis, representing the two curves of the urethra (see chapter on

Anatomy). A set of these sounds should contain both blunt and conical tips. At times one shape will pass when the other will not, depending upon the type of obstruction.

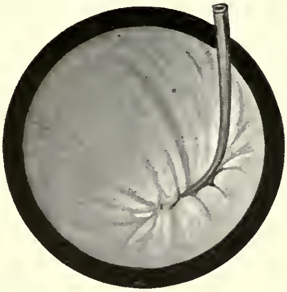

Fig. 74.—The appearance of the filiform after its introduction into the stricture.

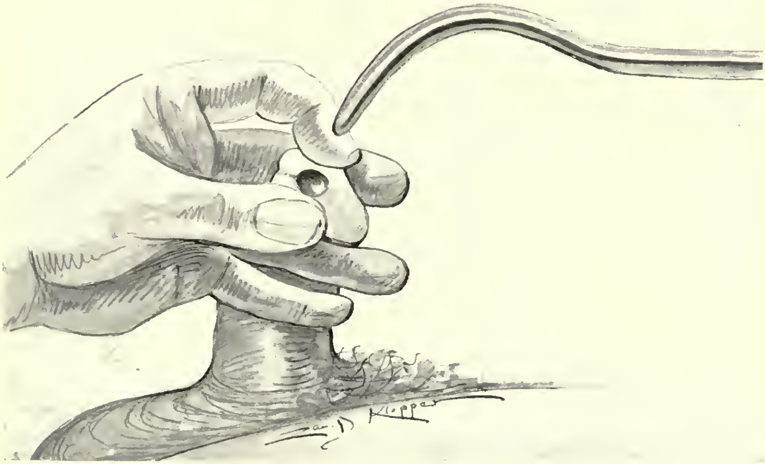

Fig. 75.—The glans is grasped at the corona and held between the third and fourth fingers. With the thumb and index-finger the lips of the meatus are separated. The penis is held taut at right angles to the body in prone position.

The technic of passing the posterior instruments is demonstrated in Figs. 75 to 79.

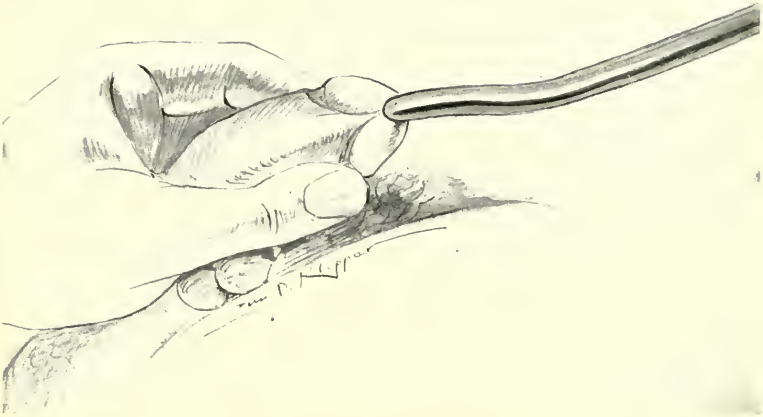

Fig. 76.—The tip of the sound is introduced and the penis is drawn upward over the instrument until the tip rests upon the perineum at the perineoscrotal junction.

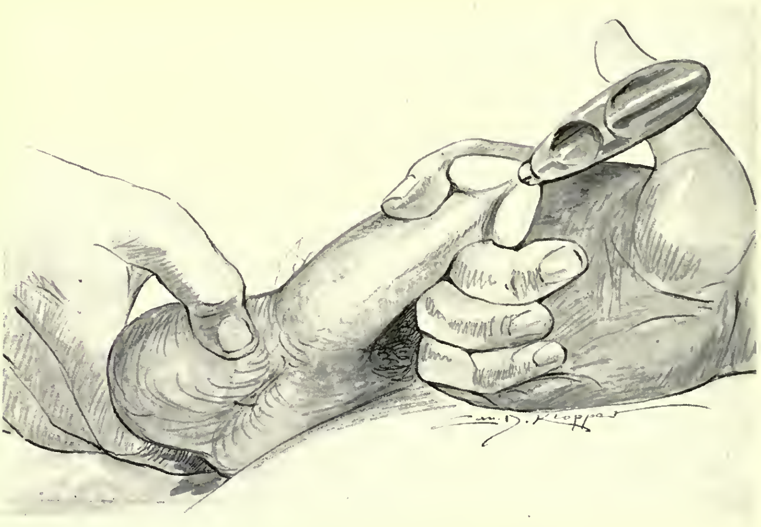

Fig. 77.—With one hand under the scrotum the instrument in the urethra is lifted upward and inward, the other hand retaining its hold at the corona; the thumb making gentle pressure forward at the flat surface of the sound, but never at the top of it.

Always remember the danger of producing trauma by using force. A little experience will demonstrate that gentle pressure at the perineum without applying force to the handle of the instrument will usually lead the sound past the stricture.

Should several attempts prove unsuccessful, wait a few days before proceeding further.

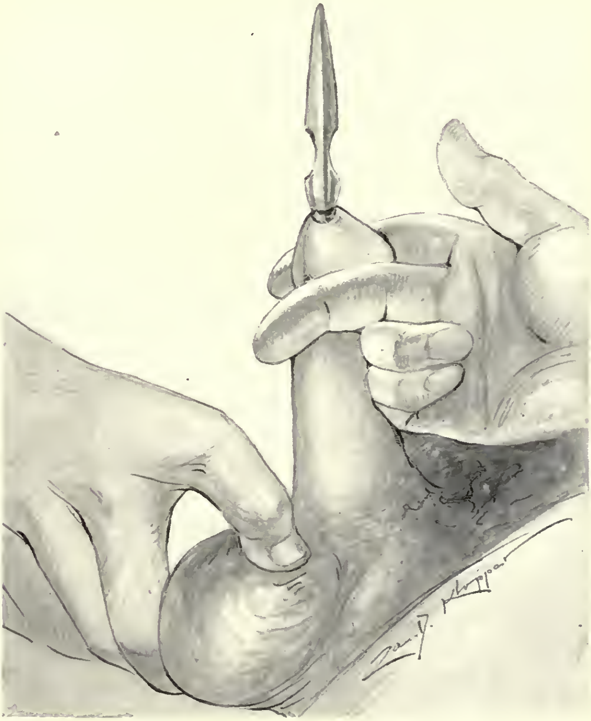

Fig. 78.—The penis is now lifted upward and forward, held taut at the corona, the thumb being withdrawn from the instrument. Firm pressure is made on the perineum during this maneuver.

Now is the time to try the filiform and follower by the "multiple method." Once successful, it does not necessarily follow that each succeeding attempt will meet with the same result. Each time a slightly larger instrument should be passed. The intervals should vary from once to twice weekly in the beginning, gradually making them further apart. The patient should keep in touch with the physician for an indefinite period, even though a No. 30 to 35 French passes with ease. It may be necessary to explore the canal only two or three times a year, yet this is very essential and will prevent any chance of recurrence.

The writer condemns dilators or rapid dilatation as dangerous and unnecessary. Gradual dilatation is the method of choice.

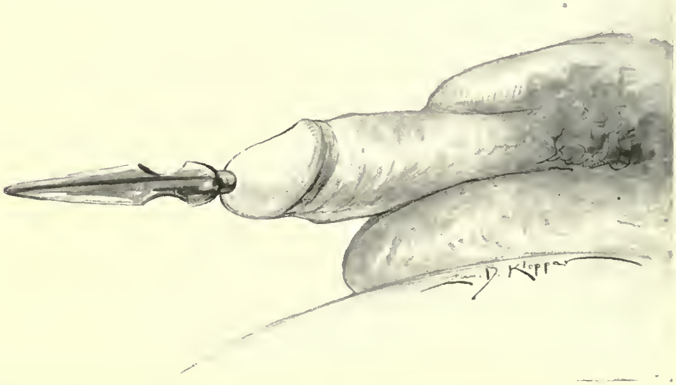

Fig. 79.—The instrument will now drop into the bladder if there is no obstruction.

Indications for Urethrotomy.—The author is strongly opposed to indiscriminate operating for the relief of strictures, as practised by so many surgeons. There are few strict indications for operative interference. These are the following:

1. Retention of urine, which cannot be relieved on account of the obstruction admitting of no instrumentation.
2. Multiple strictures which produce such pronounced interference of micturition that symptoms of urosepsis are beginning to manifest themselves.
3. Intolerant urethra which permits of instrumentation with great difficulty, even with local anesthesia.

4. Severe urethral sepsis following attempt at instrumentation, manifested by chill, high temperature, and collapse.

The most commonly encountered of these four indications is the acute retention of urine. For the temporary relief of this condition, when for some reason or other operation cannot be performed immediately, the suprapubic punch is suggested. The instrument for this purpose is the curved trocar (Fig. 80). It is plunged into the skin just above the symphysis pubis and will readily enter the bladder. There is no danger of encountering the peritoneum or viscera, as they are pushed upward by the distended bladder.

After entering the viscus the trocar is removed and the urine escapes through the canula, which can be left *in situ*, or a soft-rubber catheter may be threaded through it and the canula removed. The catheter may be left as a bladder drain for several days, but it is rather a risky proposition to leave the metal tube in for more than a few hours, for fear of injury to the mucous membrane.

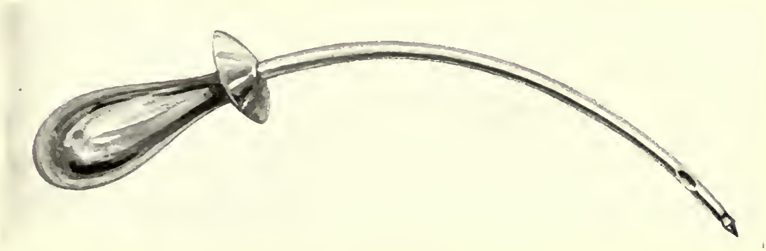

Fig. 80.—Suprapubic punch.

Internal Urethrotomy.—The Otis urethrotome (Fig. 81) is the instrument of choice and may be used in almost every instance. Occasionally, when the opening will only admit a filiform, the Maisonneuve urethrotome (Fig. 83) will be needed. This instrument is led into the opening by the preliminary introduction of a filiform screwed into the tip of the urethrotome, the knife then being drawn past the stricture.

The stricture is located with an olive-tipped diagnostic. The distance from the meatus is measured and the urethrotome introduced to this point. The blades are then dilated up to about 30, the knife being drawn upward past the stricture and then pushed back into its sheath. The scale of the dilator should face the anterior urethral wall, thus bringing the cutting edge of the knife to the wall where the incision should be made.

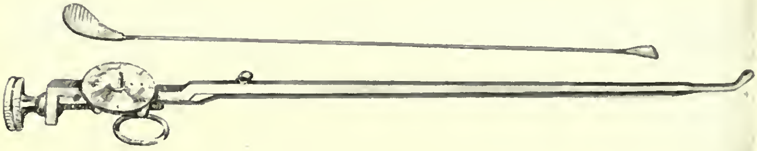

Fig. 81.—Otis urethrotome closed.

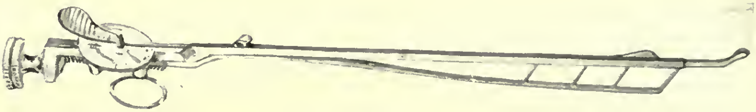

Fig. 82.—Otis urethrotome opened.

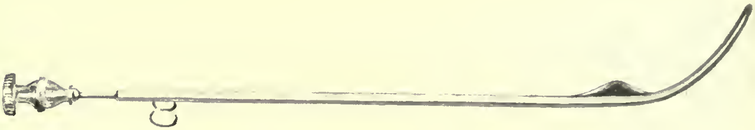

Fig. 83.—Maisonneuve urethrotome.

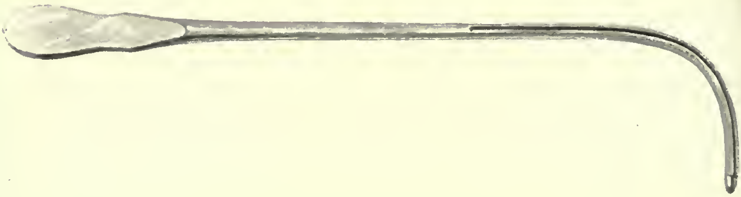

Fig. 84.—Grooved sound.

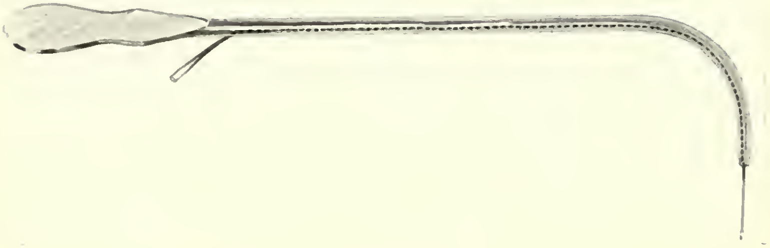

Fig. 85.—Tunneled staff with filiform.

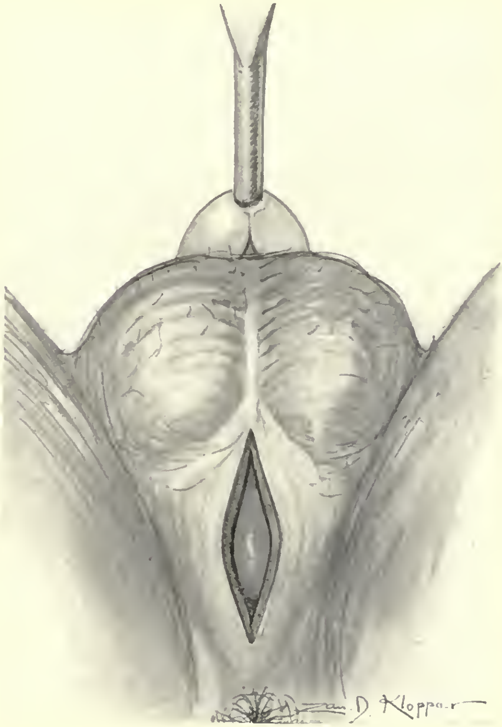

Fig. 86.—External urethrotomy: the incision.

Injury to the mucous membrane is avoided by gently withdrawing the instrument before completely closing the blades.

Again the diagnostic is used to ascertain if there is any further obstruction; if so, the same procedure is followed.

External Urethrotomy.—The patient is firmly placed in the lithotomy position and a grooved sound (Fig. 84) introduced into the urethra as far as possible. If only a filiform will pass, a tunneled staff (Fig. 85) is threaded over it and the filiform withdrawn. The scrotum is held up out of the way. The incision is made half-way between the base of the scrotum and the anus (Fig. 86). All presenting structures are carefully pushed aside. If some of the fibers of the transverse perinei muscle present, take care not to cut them, but push them out of the way. All

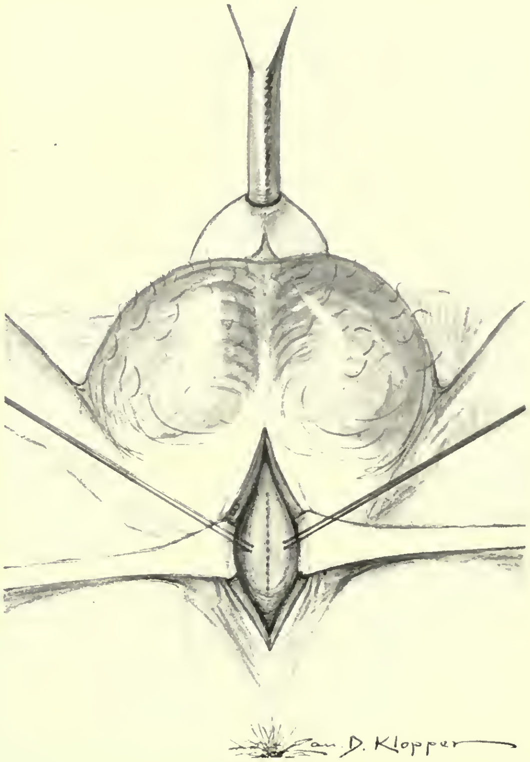

Fig. 87.—External urethrotomy: tension sutures introduced.

bleeding vessels should be promptly ligated. The bulbocavernosus muscle may be very highly developed and thereby very troublesome. Great care should be taken not to injure it in any way, as the hemorrhage resulting will prove very difficult to control.

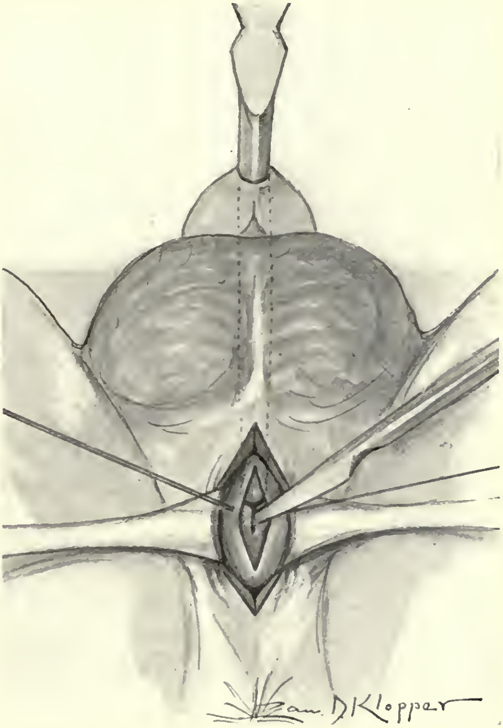

Fig. 88.—External urethrotomy: incision through the urethral wall.

Having now gotten down to the urethra, a tension suture (Fig. 87) is placed on either side and an incision is made into the walls down to the sound (Fig. 88). The instrument is partially withdrawn and with a gorget (Fig. 89) the canal is followed into the bladder, which latter is recognized by the escape of urine. The finger is then cautiously introduced to ascertain if there are any indurated areas in the urethra and if there is any contraction at the vesical neck. Any tightened bands are incised with a blunt curved bistoury (Fig. 90) and any roughened areas are

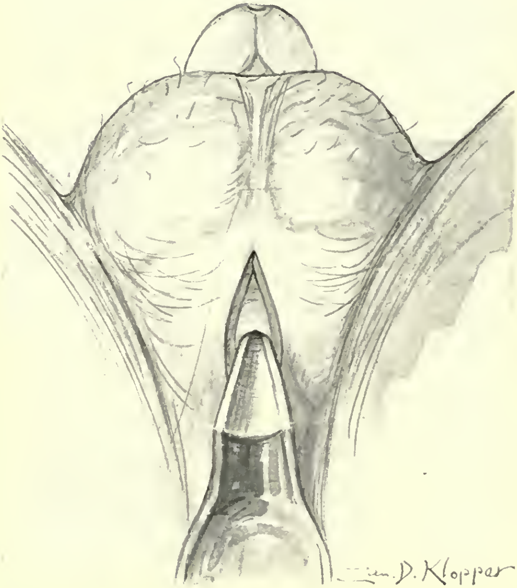

Fig. 89.—External urethrotomy: introduction of gorget

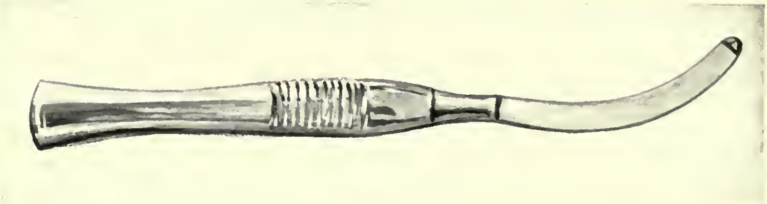

Fig. 90.—Blunt, curved bistoury.

excised. The canal now should admit from meatus to the internal urethral orifice a No. 35 French sound.

A rubber tube 1.5 to 2 cm. in diameter should be introduced into the bladder for drainage (Fig. 91, *b*). If internal urethrotomy has been performed a No. 20 or 22 French soft-rubber catheter should be passed through the urethra from the meatus into the bladder (Fig. 91, *a*). It should be removed in twenty-four hours, and the perineal drain in seventy-two hours. Iodoform or any other antiseptic gauze is packed around the perineal drain to control hemorrhage. This gauze is removed in from twenty-four to forty-eight hours. Little if any suturing is necessary. Possibly two silkworm-gut sutures are used to close

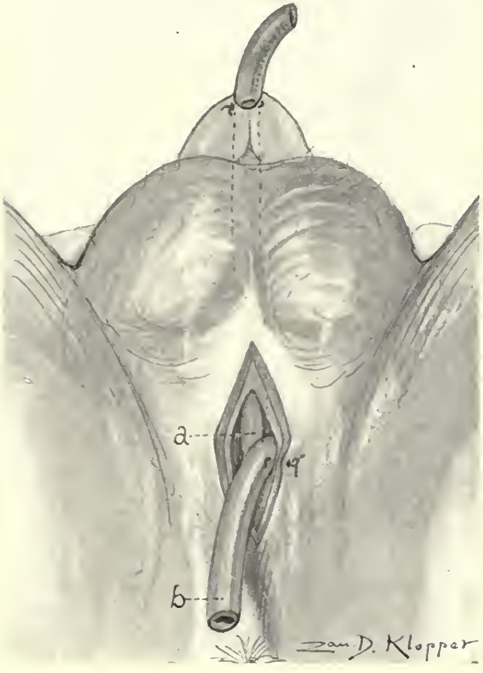

Fig. 91.—External urethrotomy: *a*, Soft-rubber catheter passed into bladder; *b*, rubber drainage-tube introduced into bladder.

the skin and fascia. It requires from one to three weeks for the perineal fistula to completely close.

Instrumentation through the urethra should begin in ten to fourteen days after the operation.

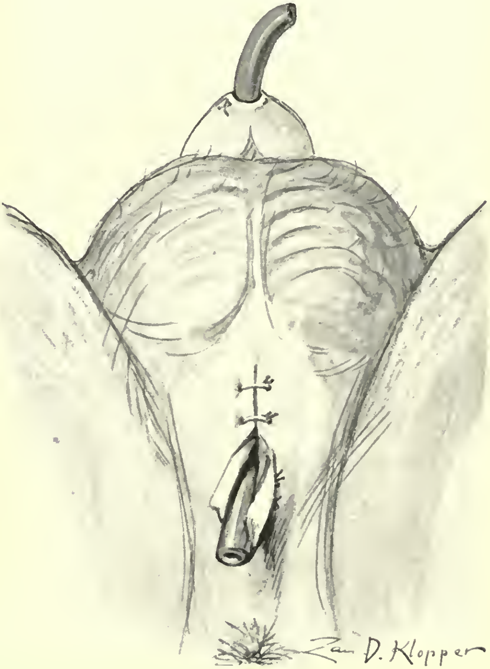

Fig. 92.—External urethrotomy closed.

External urethrotomy may be, and not infrequently is, a most difficult task, as it may be necessary to open the urethra without any guide.

Suprapubic cystotomy (Fig. 93) is required when retrograde catheterization is necessary to find the urethra. The bladder should immediately be closed without any drainage.

Partial resection of the urethra may be necessary, as is indicated by marked induration of the peri-urethral structures. In short, urethrotomy is not an operation for the novice to attempt, since one cannot be certain what will be encountered until after the operation is under way.

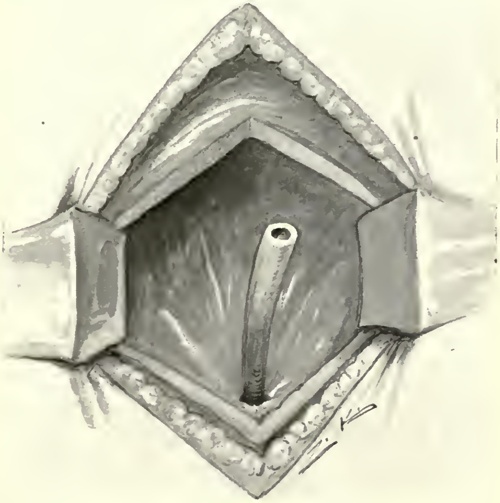

Fig. 93.—Retrograde catheterization by suprapubic cystotomy.

Permanent results, it must be remembered, can be obtained only by keeping the patient under observation indefinitely.

CHAPTER IX

NON-GONORRHEAL URETHRITIS

In the male the urethra harbors from fifteen to thirty different strains of bacteria in 20 per cent. of cases. These organisms, though usually non-pathogenic, may become pathogenic under various stimuli. This statement, therefore, has a definite significance in pointing out the fact that many cases of urethral inflammation are due to causes other than venereal, and many urethral discharges are due to bacteria other than the gonococcus.

This fact should be considered from a physical and therapeutic point of view, but is important also from a social standpoint. Many times unwarranted insinuations and disastrous accusations have been made because of wanton ignorance on the part of the physician.

The macroscopic appearance of the discharge and even the morphologic characteristics of the bacteria are often not sufficient data upon which to base final conclusions. This will be shown under the diagnosis.

There are many factors and stimuli which predispose to inflammation of the urethral mucous membrane and produce a discharge. It may be difficult, if not impossible, to demonstrate any organism in some of these discharges, either by direct smear or by culture. However, in the light of our present acceptance of the pathology of inflammation some bacteria must be present.

The predisposing etiology, then, may be classified as follows:

1. Uncleanliness.

(*a*) On the part of the female who unconsciously cleanses her anus after defecation by wiping toward the vagina instead of away from it. She thus carries infectious material into the vagina which is readily conveyed to the male urethra in coitus, though it does no harm to the mucous membrane of the vagina itself.

(*b*) Long, tight prepuce, which accumulates smegma and legions of saprophytes.

2. Constipation. Intestinal stasis and accumulations of feces in the lower tract are accountable for the greater percentage of non-venereal infections of the genito-urinary tract.

3. Secondary to inflammations of—

(*a*) Prostate and seminal vesicles.

(*b*) Urinary bladder.

4. Traumatic.

(*a*) Falls and blows.

(*b*) "Stormy coitus"; so-called "strain," which is a transient hyperemia and disappears without any treatment.

5. Mechanical.

(*a*) Instrumental, intra-urethral masturbation.

(*b*) Foreign bodies.

(*c*) Brutal and careless instrumentation.

6. Chemical.

(*a*) Acute and chronic alcoholism (Fig. 94). Many cases of "gleet" are nothing but a catarrhal urethritis which is observed only after the use of alcohol in some form. Severe urethritis often follows intoxication and persists only until the alcohol is eliminated from the system.

(*b*) Phosphaturia, seen in old men who have residual urine due to prostatism.

(*c*) Hyperacidity of the urine (Fig. 95). This may be due either to oxalic acid or uric acid. The latter is occasionally met in young children, and produces not only a purulent discharge but a slight terminal hematuria.

(*d*) Concentrated irrigating solutions, usually potassium permanganate (Fig. 96). This may prove very stubborn to treatment. The author has seen a cast of the entire urethral mucous membrane, due to retention of a 1 : 500 potassium permanganate solution. Prophylactic urethral instillations may also, if too strong, cause inflammation.

7. Thermal.

(*a*) Instruments which have been introduced before being allowed to cool, after sterilization.

(*b*) Overheated and improperly fitting endoscopic lamps.

(*c*) Irrigating fluids which are too hot.

8. Secondary to some of the acute infectious diseases, particularly typhoid (Fig. 97). It is not so rare to see a urethral discharge concurrent with typhoid fever. The bacillus may always be easily identified. Its persistence after convalescence is still a subject for debate.

The following bacteria have been cultivated from the normal urethra. The greatest number are found between the meatus and fossa navicularis. The deeper the approach into the urethra, the fewer are the bacteria. The bulbous urethra is usually quite free. The organisms in the order of their frequency are:

Aërobic:
  Staphylococcus albus.
  Staphylococcus aureus.
  Staphylococcus citreus.
  Bacillus pseudodiphtheriæ.
  Micrococcus subflavus of Bumm.
  Micrococcus lacteus fariformis of Bumm.
  Micrococcus citreus conglomeratus of Bumm.
  Streptococcus urinarius.
  Streptococcus giganticus urethræ of Lustgarten.
  Pseudogonococcus of Steinschneider.

Anaërobic:
  Various strains of staphylococci.
  Bacillus ramosus.
  Bacillus refringens.

Very few references are to be found concerning the presence of parasites in the urethra. Pfister, of Cairo, Egypt, reports the frequent occurrence of bilhariza in the posterior urethra, producing stricture.

Of the pathogenic organisms the colon bacillus is productive of the greatest number of infections (Figs. 98 and 99). Its

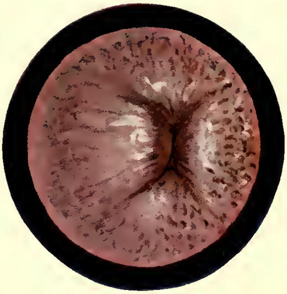
Fig. 94.

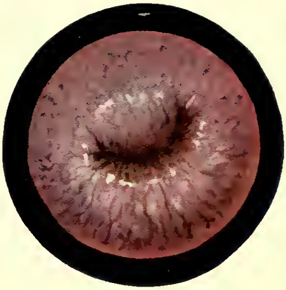
Fig. 95.

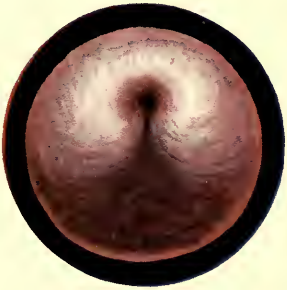
Fig. 96.

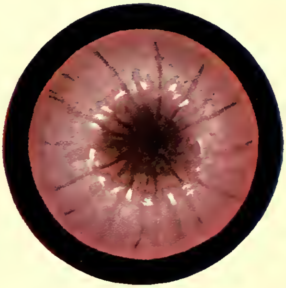
Fig. 97.

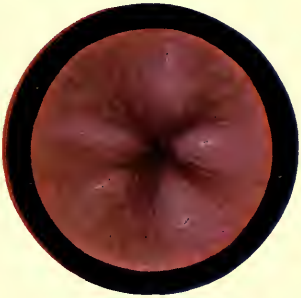
Fig. 98.

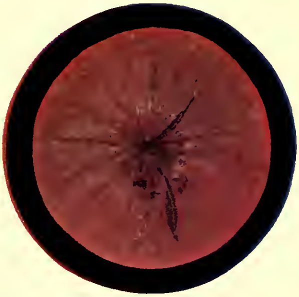
Fig. 99.

Fig. 94.—Chronic alcoholic urethritis. The entire length of the urethral mucous membrane presented the same degree of granulation formation, with edema, producing the distortion in the lumen.

Fig. 95.—Marked hyperemia due to persistent hyperacidity of the urine.

Fig. 96.—Chemical urethritis due to repeated irrigations with a hot 1 : 500 solution of potassium permanganate.

Fig. 97.—Chronic urethritis in a convalescent typhoid patient. The bacilli were not isolated from the discharge. No previous history of gonorrhea.

Fig. 98.—Colon bacillus urethritis. Note the intensity of the inflammation and the marked swelling of the mucous membrane.

Fig. 99.—Deep fissures of the mucous membrane. Same case as Fig. 98.

source is either venereal or its presence is due to direct extension from the rectum. Next in frequency are the staphylococcus (Fig. 100), then Micrococcus catarrhalis, and, last, the streptococcus. Isolated cases of urethritis are recorded from pure cultures of Bacillus lactis aërogenes, pneumococcus and Bacillus pyocyaneus, and the pseudodiphtheria bacillus (Fig. 101).

Tuberculous urethritis (Fig. 102) is always secondary, usually extending downward from the bladder and occasionally from the prostate and seminal vesicles.

The Ducrey bacillus always produces a urethral discharge if the chancroid is intra-urethral. However, the Spirochæta pallida may invest the mucous membrane without causing any discharge whatever.

The **pathology** of these urethritides is interesting, but may be very misleading. The various bacteria just mentioned often appear as a complication of gonorrhea. The colon bacillus is the only one of them frequently found in the posterior urethra in pure culture. However, it is not rare to find pyogenic involvement of the epididymi, the origin of which can be clearly traced to one of the strains of saprophytes which has become pathogenic from some idiopathic stimulus.

The staphylococcus may invade the glands of Littré and produce a marked infiltration of the crypts, subsequently causing a stricture of the resilient variety.

These organisms do not often penetrate the deeper structures and produce a peri-urethritis, though the possibility must be considered.

Lymphangitis, adenitis, bubo formation, followed by suppuration due to the staphylococcus and streptocuccus, are by no means rare. These cases are occasionally seen when there has been no evidence whatever of urethritis, the organisms having reached the inguinal glands through the urethral lymphatics.

Intra-urethral chancroids (Fig. 103) are uncommon. They extend circularly along the mucous membrane, and if not diagnosed and properly treated, invariably produce a narrowing of the urethra.

Intra-urethral chancres (Fig. 104) are probably much more common than was formerly believed. They leave no permanent scar and have the appearance of a chancre at any other location.

Symptomatology and Diagnosis.—Except for a slight burning and suggestion of tenderness, usually during erection, there are no subjective symptoms.

The examination of the discharge is, of course, the all-important point. It is absolutely impossible at any time to make an accurate diagnosis from "smears" alone. Cultures must be made. Without this accurate diagnosis no rational therapy can be instituted.

The color, consistency, and quantity of the discharge do not give us any reliable aid. In character it may be nearly like that in gonorrhea and on microscopic examination show an organism with staining properties identical with the gonococcus. This is particularly true of Micrococcus catarrhalis, which, however, is differentiated by the fact that it will grow on ordinary media at room temperature.

The staphylococcus, streptococcus, and colon bacillus are all easy to identify, but may require the technic of the expert bacteriologist, should they be combined with the gonococcus; a point of warning to the inexperienced. The result of such an error is self-evident. The diagnosis of intra-urethral chancre and chancroid can only be made with the endoscope and then may be difficult, should the infection have progressed toward healing. In the beginning the physical character of these two lesions is typical.

Tuberculosis should be easy to diagnose. The history and examination of the entire genital tract will give the necessary data and the correct conclusions. Endoscopic examination is usually impractical on account of pain and is rarely necessary.

Course and Prognosis.—Immediate and rational treatment usually gives prompt relief. These infections rarely become chronic. The Bacillus coli and staphylococci in combination are more resistant to treatment. The course varies from one to two weeks.

Fig. 100.—Staphylococcic urethritis. Numerous small ulcers which are comparatively deep. The entire pendulous urethra presented this picture.

Fig. 101.—Membranous or exfoliative urethritis. The pseudodiphtheria bacilli were seen on direct "smear" and were isolated in pure culture.

Fig. 102.—Tuberculous urethritis. Extension from involvement of the prostate, vesicles, and epididymi. Primary lesion was in the right epididymis.

Fig. 103.—Intra-urethral chancroid. Ducrey bacilli were found in the discharge.

Fig. 104.—Intra-urethral chancre. Palpable externally on account of the induration. Secondary skin lesions appeared simultaneously.

Fig. 105.—Carcinoma of the urethra.

Fig. 106.—Sarcoma of the urethra.

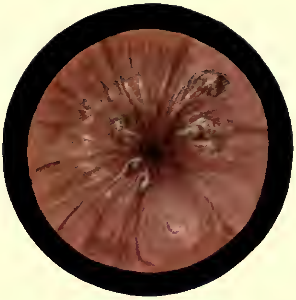

Fig. 100.

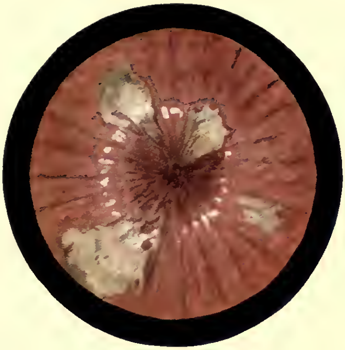

Fig. 101.

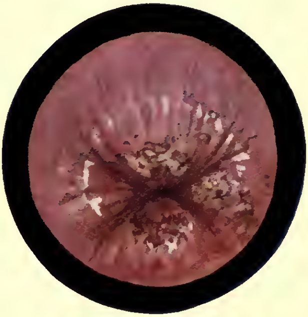

Fig. 102.

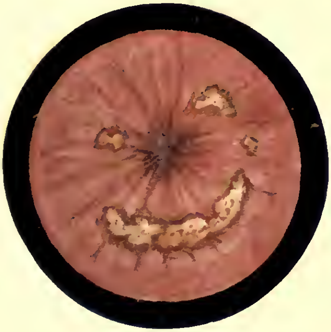

Fig. 103.

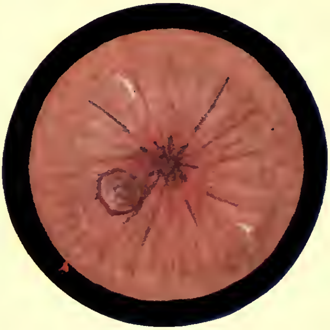

Fig. 104.

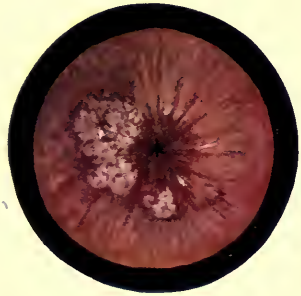

Fig. 105.

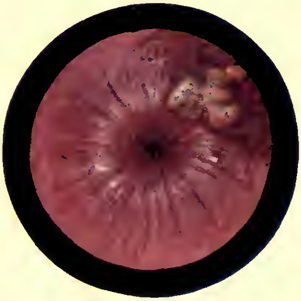

Fig. 106.

Treatment.—The author has found it expedient to vary the drugs used in the instillations, according to the definite organisms identified. The instillations are prescribed three times daily and should be retained fifteen minutes each time. Large quantities of water should be drunk to keep the canal free from pus accumulations.

For the colon bacillus the 0.5 per cent. solution of aluminum acetate (National Formulary), gradually increased to 2 per cent. upon tolerance, is effective.

For the staphylococcus, 1 : 5000 oxycyanid of mercury and a 1 to 2 per cent. solution of chinosol for the Micrococcus catarrhalis, may be employed.

When either chancre or chancroid is suspected, careful endoscopic examination should be made. If chancroidal ulcer is found, make topical applications of tincture of iodin, care being taken that the applicator does not contain too much of the tincture, which may run down the urethral mucosa and produce considerable distress. If chancre is diagnosed, of course antileutic measures are at once begun.

In resistant cases the endoscope should be freely used. Often discrete ulcerations or fissures (Figs. 99 and 100) will be seen. These should receive topical applications of nitrate of silver from 10 to 25 per cent. Occasionally hexamethylenamin in combination with sodium benzoate may augment the treatment, as in the following prescription:

Hexamethylenamin Sodium benzoate	*āā* 4.00

Make into twelve capsules.

CHAPTER X

URETHRORRHEA, PROSTATORRHEA, AND SPERMATORRHEA

URETHRORRHEA

This mucous discharge from the urethra may prove to be a very annoying condition, more particularly from consideration of the psychic influence upon the patient than from any physical harm that it may produce.

Great care must be observed not to overlook any true pathology. Examination of both the discharge by direct microscopy and the urine grossly and microscopically should always be made.

The discharge from a true urethrorrhea contains practically nothing but mucus with some epithelial cells and an occasional white blood-corpuscle. The urine shows the floating mucous shreds which are microscopically identical with the discharge.

It is often very difficult to convince a patient that despite the discharge he is not a source of infection. This discharge can often be stopped, but just as often, notwithstanding prolonged and careful treatment, it will persist.

The various causes may be listed as follows:

1. As a sequel to gonorrhea.

2. Associated with or resulting from acute or chronic alcoholism. A very small amount of alcohol, such as a single drink of beer or brandy, may be sufficient to produce a discharge which will spontaneously cease if the alcohol is discontinued, only to reappear with its continuance.

3. After prolonged sexual excitation without gratification. It may only be the emptying of Cowper's glands or the serous urethral glands, yet patients will often seek consultation for this particular type.

4. Following the completion of micturition. This again, is due to pressure upon Cowper's glands, by contraction of the sphincter muscle as it expresses the last drops of urine from the bladder. There is nothing pathologic about it, as it indicates a very highly developed sphincter muscle.

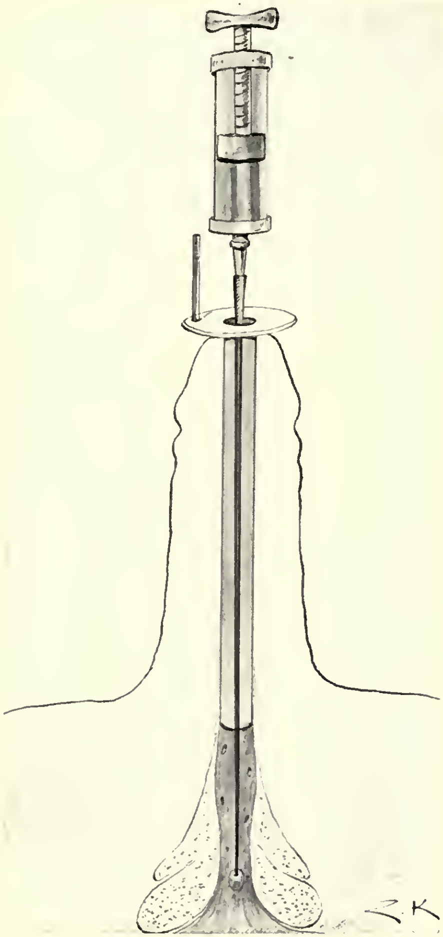

Fig. 107.—Injecting the utricle by means of the Geraghty syringe.

Treatment.—Except for the variety resulting from gonorrhea the condition is purely a physiologic one, and besides reassuring the patient's perturbed mind, nothing should be done.

For the discharge that results from gonorrhea, astringent instillations should be tried. The source of the catarrh may be the utricle, which should be injected with nitrate of silver (1 to 3 per cent.) through the endoscope with the Geraghty syringe (Fig. 107).

PROSTATORRHEA

There are two distinct varieties of this condition, one that arises only during the movement of the bowels, "defecation prostatorrhea," and another that is secondary to a prostatospermatocystitis.

The discharge in the first type seldom contains any inflammatory products, but shows starch granules, possibly a few spermatozoa, and much mucus.

The examination of the spontaneous discharge from the inflammatory variety shows more spermatozoa, epithelial cells, amyloid bodies, and white blood-corpuscles.

The discharge obtained by stripping the vesicles and prostate in addition contains casts of the vesicular tubules made up of seropurulent material.

For prostatorrhea during defecation relief of straining at stool by means of catharsis will clear up the condition. For the inflammatory discharge systematic massage in conjunction with antiphlogistic measures as described under Prostatitis will cure the condition.

SPERMATORRHEA

Here, again, we have two distinct types—physiologic and pathologic. The former is what is termed "nocturnal pollutions" or "wet dreams."

It may be caused by overdistention of the vesicles, due to infrequent sexual intercourse; to a very highly sensitized posterior urethra, secondary to sexual overindulgence or sexual abuses, such as masturbation; or to irritation of the seminal vesicles secondary to constipation.

Great mental distress is very often encountered in these patients and they fear that they are "losing their manhood" and are becoming weakened by the loss of semen.

Psychasthenia of the most pronounced order usually results, especially if the patient is of only mediocre intelligence, and the final step is usually toward the charlatan, unless the confidence of the patient is obtained.

The **treatment** really should be both mental and medicinal. Nearly all of these patients have some of the elements of the neurasthenic in their make-up and must be handled accordingly.

It is seldom that the occurrence of these pollutions is frequent enough to produce any actual harm. As a matter of fact, the discharge contains more sero-albuminous material than spermatozoa and in many ways the condition may be considered as a sort of nature's safety-valve.

One must be guarded in advising coitus irrespective of the risk of moral contamination, for the advice may act as a boomerang and the patient return with an acute gonorrhea or a chancre.

Therapeutically, the first step is to remove the cause. The best results in the irritative type are obtained from the topical application of pure nitrate of silver to the caput per endoscope. This is to be repeated at intervals varying from a week to ten days.

Ergot has been suggested as a muscle tonic, but the idea is purely empiric and the author has never obtained any result therefrom.

CHAPTER XI

TUMORS OF THE URETHRA

A CONSIDERATION of neoplasms of the urethra occupies an unimportant part in a treatise of diseases of the urethra because of their relative infrequency. They may be classified as follows:

1. Benign:
    - (*a*) Papilloma.
    - (*b*) Condyloma.
    - (*c*) Polyp.
    - (*d*) Cyst.
    - (*e*) Angioma.
    - (*f*) Fibroma.
2. Malignant:
    - (*a*) Sarcoma.
    - (*b*) Carcinoma.

Papillomata (Figs. 108 and 109) are the type of newgrowth most often found. They may be located at any point along the course of the urethra, but are most often found just inside the meatus. Several cases of multiple papillomata have been reported. The most startling is the one presented by Elder, in which the growths were so dense in the bulbous urethra that it was not possible to distinguish any normal mucosa. The growths are usually single.

Histologically these papillomata are to be distinguished from condylomata by the highly developed vascularization of the former. The structure is identical with the same type of tumor found elsewhere.

Except for slight hematuria, usually terminal, and occasional urethral discomfort, there are no symptoms. In the Elder case the entire urethra was exquisitely tender and the hematuria was marked.

The **diagnosis** can be made only with the urethroscope.

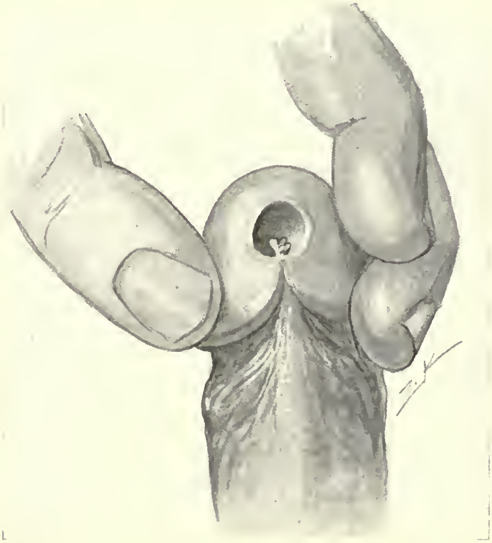

Fig. 108.—Small papilloma at the meatus.

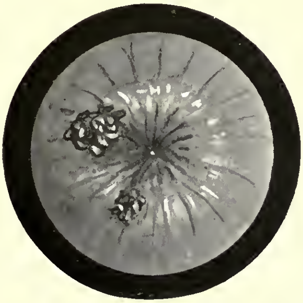

Fig. 109.—Sessile papillomata of the urethra.

The most efficient means of removal is the galvanocautery or the fulguration spark.

Condylomata may be sessile and appear in large, thick masses, implanted upon the urethral wall. They resemble the preputial vegetations grossly and microscopically. They are located usually in the penile portion, just behind the glans. Rarely they are found in the posterior urethra at the veru.

They are best removed by fulguration.

Polypi (Fig. 110) of the urethra arise through hypertrophy of the glandular follicles of the mucous membrane. They are analogous to the nasal polyp. They may be situated at any point along the urethra and occur occasionally in young children. The author had one case in a thirteen-month-old child in which the polyp was situated at the internal urethral orifice with its pedicle in the posterior urethra.

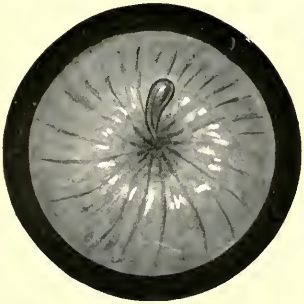

Fig. 110.—Mucous polyp of the urethra.

The electric spark is the best means of removal of polypi.

Cysts of the urethra are of two kinds: retention cysts and inflammatory cysts. They may be present at any age. They are usually found in the anterior urethra. They may be the size of a small pea, or they may attain considerable volume. The contents may be serous in the retention variety, or serosanguineous in the inflammatory. The former are, as a rule, single; the latter, multiple.

The retention cyst is usually discovered by accident during an endoscopic examination. They never produce any symptoms.

The inflammatory cysts cause discomfort and pain or frequency of micturition, if located posteriorly. There may be a serosanguineous discharge.

The galvanocautery is the best means of destroying the cyst-wall and lining.

Cysts of the utricle are a great rarity. Most often those described have been found at autopsy. Anatomically they are like other mucous cysts. The ejaculatory ducts are always excluded. The contents are serous or seropurulent.

Angiomata of the male urethra are very uncommon. They are usually situated in the prostatic urethra and may be connected with the utricle. They produce profuse intermittent hemorrhages.

Fibromata of the male urethra also are very rare. They vary greatly in size from a pea to a hen's egg, as reported in one case. They are usually pedunculated and in contour resemble a polyp.

Histologically they are not purely fibromatous, as a rule; but in their centers are usually cystic. One case recently reported, found at autopsy by Jackson, shows a pure fibrous condition.

Physically the smaller fibromata are to be considered with polypi and can only be definitely distinguished microscopically.

Primary carcinoma (Fig. 105) of the urethra is very rare. The literature yields not more than 50 or 60 cases. Only 2 of these were in the United States. Sixty-three per cent. of the cases originated in the perineal portion of the urethra, 37 per cent. in the penile.

The structure of the growth is that of a pavement-celled epithelioma.

The tumor may reach a considerable growth before symptoms develop or there may be early signs of urethral obstruction. In only 2 of the reported cases was the diagnosis made by means of the endoscope. Rapid increase in size of a non-inflammatory swelling, usually very painful and exquisitely tender, together with obstruction, should lead one to suspect carcinoma.

The progress of the growth is fairly rapid, death occurring from metastases within a year.

Treatment at best is unsatisfactory, as it entails very extensive surgical intervention.

Only 11 cases of sarcoma (Fig. 106) of the male urethra have been reported. They are, therefore, the rarest of urethral tumors.

The histologic structure varies; some of the cases are lymphosarcoma and some melanosarcoma.

Growth is more rapid than in carcinoma.

In diagnosis it may be confused with a large, simple polyp. The rapidity of the growth and pain may serve as differential points.

CHAPTER XII

SEXUAL IMPOTENCE

There has always been a surfeit of articles variously titled having more or less bearing upon sexual impotence. Few such publications have, however, adequately presented the subject *per se*, but have considered impotence along with other sexual disturbances covering scientific fields, reaching from sexual hygiene and the psychology of sex to the sociologic status of mankind. Impotence is but imperfectly understood and by many medical men considered synonymous with sterility. It should be superfluous to differentiate, but inasmuch as the term is so widely misinterpreted the following explanation is offered.

The term conveys a relative meaning, varying in degree from premature ejaculation (*ejaculatio præcox*) to total inability to have erection. The first condition is, as a rule, a forerunner of the second. Sterility is the inability to procreate. A man can be quite sterile and yet be potent; the reverse is also true. Authentic cases are recorded where impregnation has resulted without coitus, the semen being discharged at the introitus through premature ejaculation or ejaculation occurring in the absence of erection.

The prevalence of sexual impotence, which is attended with such grave consequences, should stimulate physicians to a clearer understanding of the condition. This will result in barren marriages becoming fruitful and lessen the many instances of marital infelicity which are so appallingly due to sexual incapacity on the part of the afflicted male. It will also diminish the ever-increasing number of cases of sexual neurasthenia ending in many instances in complete mental deficiency and even self-destruction. The author appeals to medical men in general practice to better understand this symptom, which usually has for its foundation a true pathology. These patients should not be dismissed with an exhortation to "forget it," a so-called aphrodisiac pill, which is valueless, or possibly the passage of a urethral sound or a cold rectal irrigation.

Physiologic impotence or the male climacteric may occur at widely varying ages in different individuals. As with the female, early sexual activity usually means a correspondingly early cessation. Excesses during the earlier years of sexual activity may also be a strong factor in the production of premature senility of the sexual apparatus. No age or average can be given. It is indeed well to guard against giving a favorable prognosis to a man over fifty years of age who seeks relief for loss of potency, even if some true pathologic condition may be located. In such a case the condition may frequently be improved, but, as a rule, there is a request for complete rejuvenation, which, in the majority of cases, cannot be attained.

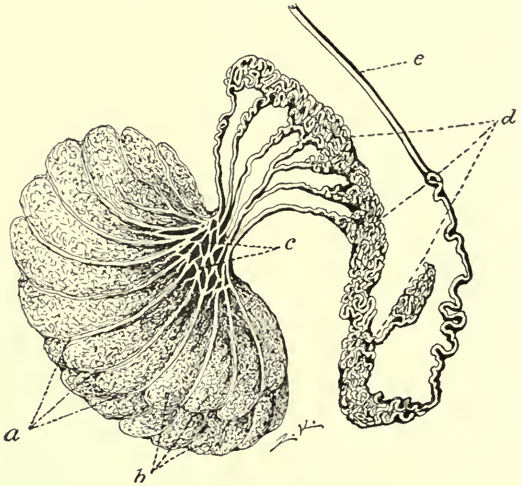

Fig. 111.—Structure of the testicle.

With the understanding, therefore, that sexual impotence is a symptom indicative of some abnormal process at work, we shall proceed first with a consideration of the physiologic anatomy of that part of the genital tract involved in organic impotency; namely, the testes and the verumontanum.

The Testicles.—Sagittal section shows the entire gland to be surrounded by a dense, fibrous envelope, the tunica albuginea, which becomes thickened at the superior border, forming a nodule, the corpus of Highmore (Fig. 111). From this nodule a number of fibrous partitions (Fig. 111, *a*) extend downward, dividing the testis into a series of lobules (Fig. 111, *b*). Within these are the interstitial substance containing the endosecretory cells or interstitial cells of Leydig, and the secretory canals or seminiferous tubules.

The secretory canals follow the direction of the fibrous partition, extending upward and outward toward the corpus of Highmore (Fig. 111, *c*), where they anastomose in a network, the rete vasculosum testis, finally reaching the superior posterior border of the testicle, toward the adherent surface or head of the epididymis (Fig. 111, *d*).

These canals are divided into two component parts.

1. The seminiferous tubules, situated within the lobules, which secrete the spermatozoa. These vary in number, according to different anatomists, from 800 to 1100. Their diameters vary from 120 to 180 mm. (Sappey) and their length from 30 cm. to 1 m.

2. The collective tubules through which the spermatozoa are collected from each lobule. These run into the corpus of Highmore from each lobule, where they anastomose to form the rete testis, from which point the efferent tubules go toward the head of the epididymis.

The supportive tissue of the testis is made up of fibrous elements and branching cells, the latter containing the special structures described by Leydig and known as the interstitial cells. The exact significance of these cells is still undecided. Unfortunately, their observation so far has been purely anatomic and there is no record of any physiologic research in connection with them. It is generally conceded, however, that these Leydig structures are cells for the elaboration of the internal secretion of the testicle, which is intimately connected with and essential to sexual potency.

The Verumontanum.—Careful search of the text-books on anatomy reveals little or nothing about the verumontanum. The gross description appears in Chapter I.

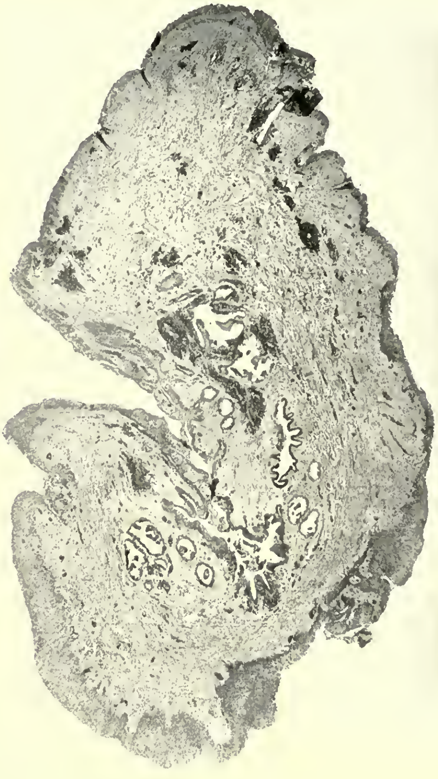

Fig. 112.—Section shows normal verumontanum, sinus pocularis through same, and ending in a complicated system of invaginated processes. Surrounding the sinus one can see normal glandular acini, and just outside this the capsule which separates the glandular from the stroma portion (Rytina).

The most comprehensive work upon its histology was done by Rytina (Figs. 112, 113, 114), whose description follows:

"The microscope readily enables us to differentiate the verumontanum into a central glandular portion and a peripheral stromal portion. The surface is covered by a many layered, stratified, squamous epithelium, similar to that seen on the surface mucous membrane of the posterior urethra. Below this one sees a layer of subepithelial connective-tissue stroma. Deeper down in the central portion one encounters groups of

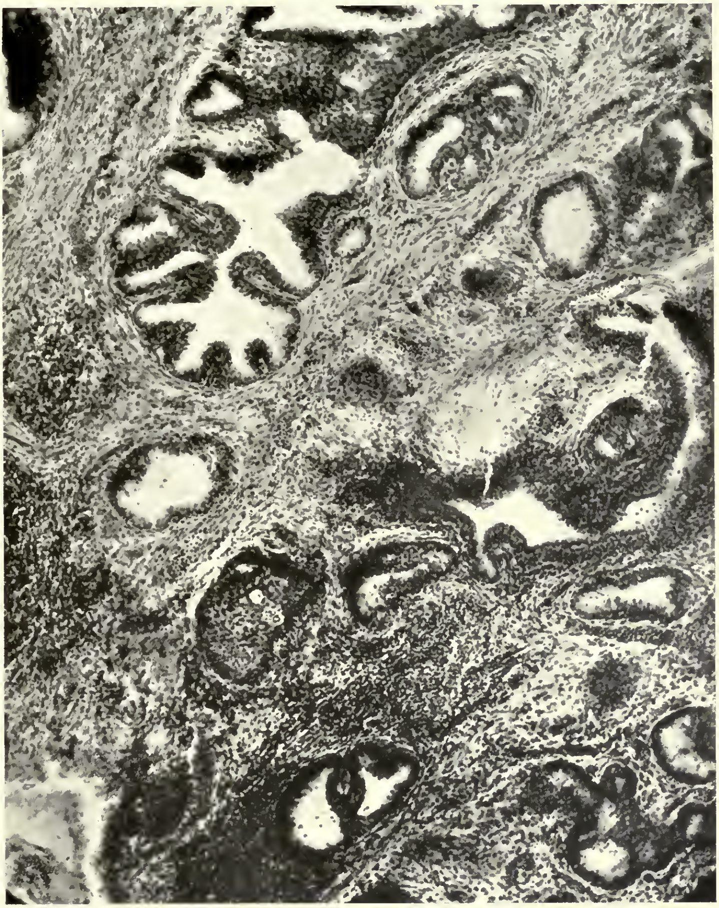

Fig. 113.—Section of verumontanum, one-half containing normal stroma and glandular acini, the other half showing marked round-cell infiltration. In one place the position of former acinus is entirely replaced by round-celled infiltration (Rytina).

glands which show numerous intra-acinous proliferations. These infoldings are composed generally of several layers of epithelial cells, which may be of the simple cuboidal, columnar, or squamous type. At times one can see the infoldings of a stratified type in

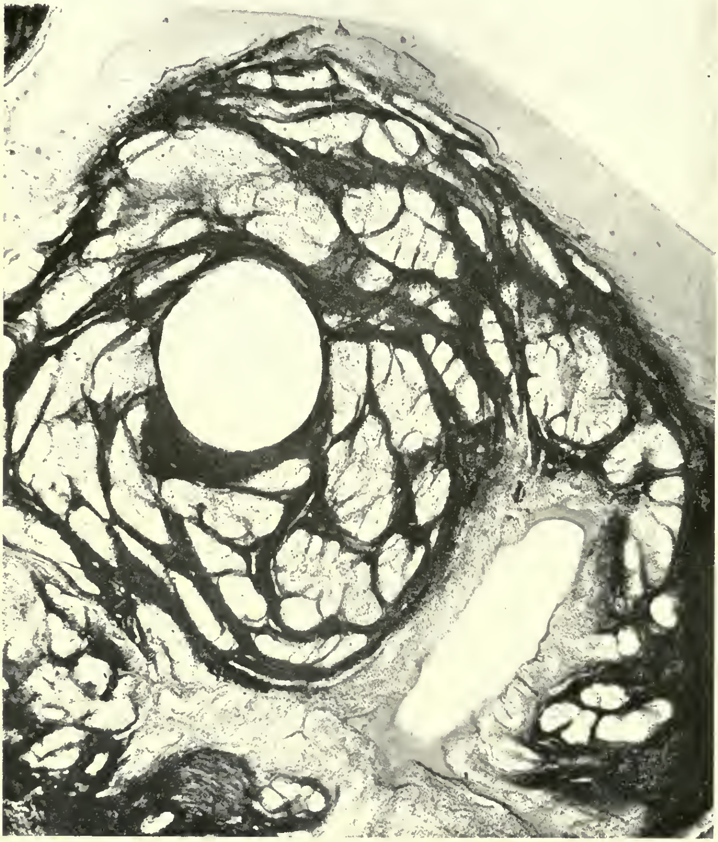

Fig. 114.—Specimen shows elastic tissue content of normal verumontanum. This section was selected especially because it shows an unusual development of this tissue in the organ—the black portion indicates the elastic tissue. The open places are glandular acini. Note how the elastic tissue forms part of the walls of the acini, and how it extends into the acini and forms part of the stalk of the infolding processes (Rytina).

one portion of the acinus, while another will exhibit the cells composed of a simple, cuboidal epithelium. At times the infoldings are composed of a solid mass of epithelial cells. More often one can see a fine supporting stalk. Many of the acini seem to be dilated. No corpora amylacea are seen and the lumen of the glands seems to be empty. The outer, or the peripheral portion, is composed largely of normal looking fibrous tissue stroma containing here and there an occasional glandular acinus, which may show the same infoldings already described. Several observers have removed polypi from the verumontanum, which had the same microscopic appearance as the foregoing and which they termed 'glandular polypi.' It is possible that they were describing the verumontanum itself. The capsule is composed of dense, circular bands of fibrous and elastic tissue. By special staining methods we were able to show that the verumontanum, both in the glandular and stroma portions, contains much elastic tissue. This, however, varies in the different specimens. It is arranged in long wavy strands, and is fairly rich in the capsular portion. From here one can see it extending into and forming part of the intra-acinous stroma, the walls of the acini and the stalks of the infoldings. Fibrous tissue, of course, is the predominating stromal element. The verumontanum is poor in involuntary muscle-fibers, not especially rich in nerves, but plentifully supplied with blood-vessels and lymphatics. This microscopic picture somewhat resembles prostatic hypertrophy. The differentiation is made by the fewer acini, the lessened dilation and the lessened infoldings of the acini, and the greater amount of intra-acinous stroma seen in the verumontanum."

"**Sinus Pocularis.**—Most text-books simply describe the sinus pocularis as a rounded or slit-like opening on the anterior summit of the verumontanum. It courses through the verumontanum and then blindly ends in the substance of the prostate. It is developed from the lowermost ends of the Müllerian ducts and is, therefore, analogous to the female uterus and vagina, on which account it has been called the uterus masculinus. Our studies show that the sinus pocularis is a long canal lined by a many-layered squamous epithelium, and by serial sections we have been able to demonstrate that it ends by a complicated system of invagination processes. They are also lined by the same type of epithelium and suggest glandular organs, but are probably only secreting surfaces. It is easy to see how favorable this structure is for retention products and suggests difficulty in eradicating infection. Surrounding the sinus pocularis are the central group of glands already described.

"**Pathology of Verumontanum.**—The only type of pathologic verumontanum that we have been able to study thus far has been that due to infection. We have had several such cases, but they nearly all show the same picture, namely, a submucous and a periacinous infiltration of round cells, among which one can see an occasional pus-cell. In some places round-cell infiltration may be so marked that it will completely replace the position of a former acinus. At times one can see in the interior of the acinus round-cells, pus-cells, or desquamated epithelial cells. Occasionally red blood-cells may be seen, the result of trauma. We have sections which show infection traveling down the length of the sinus pocularis into the invaginations below, showing the necessity of injecting the canal, as first suggested by Luys and later independently by Geraghty. Indeed, we believe that researches that we are now carrying out will show that the sinus pocularis is often the most important factor in keeping up infection in the verumontanum and that the surface appearance of the latter indicates the pathologic condition in the utricle below, as an ulcerated ureter mouth reflects kidney tuberculosis above.

"Finally, it seems to us that discharges in the urethra are perpetuated or rekindled by infection in these glandular structures, and a more wide recognition of this fact will be followed by an increased percentage of chronic gonorrhea cures."

It is with considerable regret that we are forced to admit our total ignorance of the physiologic rôle of the veru. We are wholly in the dark as to why hypertrophy of this small structure should influence man's sexual potency.

By inflammatory irritation we can, of course, understand the production of the premature ejaculation, but none of the changes thus far described give any deductions for the total loss of erectile power.

One theory advanced is that after a few unsuccessful attempts at coitus, due to the premature ejaculation, the impotence resolves itself into purely a psychic factor, and that to obtain beneficial results treatment of the inflamed gland must be both mental and physical.

The writer does not accept this theory. Careful observation of these cases shows unquestionably some direct influence upon the sexual physiology. It remains, however, for future investigators to reveal the true nature of this influence.

Our **etiologic classification** may be considered as follows:

I. Nervous system.
    1. Functional or psychic.
    2. Organic or spinal cord changes.
II. Constitutional.
III. Genital tract.
    1. Testicular.
    2. Seminal vesicular.
    3. Penile malformations.
    4. Urethral (verumontanitis).

The psychic type is very frequently encountered and is always most difficult to manage. It is a true psychosis, but may have developed slowly or suddenly, and have many factors which have played a rôle in the etiology.

The orthodox belief which the laity has so deeply ground into its moral make-up, as to the bad effects of masturbation, is a most prevalent factor in the production of psychic impotence.

It is rather a dangerous matter to openly belittle time-worn, hysteric mandates and teachings regarding the dangers of onanism; considered purely from a physiologic viewpoint masturbation in moderation is no more harmful than sexual intercourse in moderation. It is the ease with which this form of sexual gratification is accomplished that leads to overindulgence and it is this *excess* that is productive of harm. The untoward effects are principally physical, but the stigma which society has placed upon the masturbator is productive of the mental harm.

Every possible type of psychasthenia develops and only too often the unfortunate is beyond the reach of assistance and the end is disaster. The charlatan grasps at the vulnerable point of social ostracism and the unfounded mental sequelæ, and uses it to play upon the fears of misguided unfortunates.

A revision of this erroneous attitude toward onanism is suggested in the hope of better serving these patients when they present themselves for treatment.

The other factors that tend to produce functional impotence are purely psychologic—the emotions of fear and nervous shock. The fear of impregnation, venereal infection, or of failure to perform the sexual act satisfactorily are inhibiting states of mind. The nervous shock attending discovery is another mental state that has often produced subsequent failures in erection.

Any destructive process of the spinal cord involving the erectile fibers will, of course, destroy the sexual power. It should be remembered that vesical incontinence and a reduction of the *vita sexualis* are frequently the first manifestations of tabes.

The next group of morbid processes, of which impotence is one among other symptoms, is the constitutional disturbances, the most prominent of which are the various forms of anemia. It is quite common to find only an impoverished condition of the blood in a patient presenting himself for the correction of failing virility. In addition to the anemias any debilitating disease will, of course, reduce the sexual power. Strangely enough, the one exception to this statement is pulmonary tuberculosis. A number of patients in advanced stages of this disease appear to have increased libido, a condition much to be regretted in wedlock, since it predisposes to the likelihood of conception.

By far the greater number of cases have a localized pathology. This group is classified as the organic type, subdivided into those with testicular, urethral, and seminal vesicular lesions.

Of the two physiologic processes that take place in the testes, one may be destroyed without in any way affecting the other.

This seems to be particularly true of extensive bacterial invasion whereby the tubules of both testes fail to yield any spermatozoa and yet potency remains unchanged. This may be explained by the cicatricial contraction producing a pressure atrophy of the tubular epithelium, leaving the interstitial cells or cells of internal secretion unharmed. It is the internal secretion which is essential to the maintenance of masculinity. So long as some of these internal secretory seminal structures continue to functionate properly and there is an absence of other pathologic conditions, the masculine type is preserved. Just how much testicular tissue may be destroyed without affecting the sexuality cannot be definitely stated, but the total loss of one of the testes with resection of the other has not materially changed the sexual characteristics.

Atrophy of the testes produced by trauma, often received at puberty, a kick from a horse, being struck by a ball or a club, will lower the sexual capacity. The orchitis and consequent atrophy complicating specific parotitis, typhoid, and scarlet fever are well recognized, and these etiologic factors are not to be overlooked or slighted in taking a history, but must be taken into consideration in venturing a prognosis.

The destructive process of pyogenic infection, gumma of the testes, neoplasms, and tuberculosis will also destroy both the germinal and internal secretory cells.

Whether or not there exists a congenital impotence due to maldevelopment of the interstitial cells has not come to the writer's notice, either by way of the literature or personal observation. The occurrence of such a condition should not be surprising, inasmuch as the total absence of spermatozoa in a young adult is not rare. This condition may exist without any demonstrable lesions or any point in the history that would throw light upon it.

Seminal vesiculitis, either in the acute or chronic form, is not infrequently conducive to painful orgasm, which in turn affects the libido and so reduces the potency of the individual.

Congenital malformations, marked hypospadias and epispadias, or underdevelopment of the penis may produce total sexual disability, but in all probability the condition in most instances is psychic rather than organic, the patient being ashamed of his deformity, and thus the sexual desire does not develop. Acquired deformity of the penis may result from scar contraction following trauma, or severe inflammation, usually of gonorrheal origin, involving either the spongy or cavernous portion. Such conditions are almost hopeless, since plastic work on the urethra is unsatisfactory, even under the most favorable conditions and in the most skilled hands.

The verumontanum plays the leading rôle in the production of organic impotency, especially of urethral origin. This simple ridge of mucous membrane, in the normal state rich in supply of blood-vessels and lymphatics, is the seat of congestion during erection. The engorgement with blood, at first producing an active hyperemia which later becomes passive, may persist during the quiescent state of the urethra and penis. Granulations quickly form, and before long instead of being an insignificant ridge of mucous membrane it is transformed into a large, angry-looking mass of tissue varying in size from that of a pea to a small china marble (Figs. 115 and 116). Covered with granulations or fissures (Fig. 117; see also Fig. 20, opposite p. 30) and bleeding easily, it frequently produces a profuse hemorrhage which may be difficult to control.

The region of the verumontanum may present quite another picture through the endoscope. Very often instead of disclosing a prominence there is a distinct atrophy of this little eminence of the prostatic urethra. In place of chronic hyperemia, granulations and hemorrhage, distinct widening of the orifice of the utricle, loss of contractility, and pronounced anemia of the mucous membrane, not only of the region of the verumontanum but also of the entire urethra, reaching from the bulbous portion back to the sphincter of the bladder are observed. Such a picture may lead one to ask such a patient with impunity how many years he has practised onanism, and the frequency with which he indulges. If there are other evidences in the history of a life of debauchery carried to the extreme, especially associated with

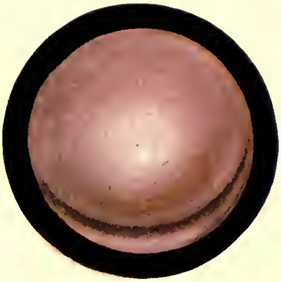

Fig. 115.

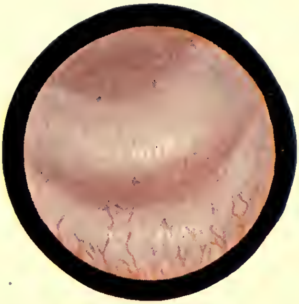

Fig. 116.

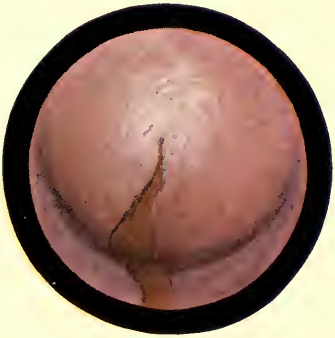

Fig. 117.

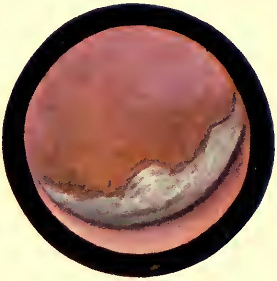

Fig. 118.

Fig. 115.—Verumontanitis. Three months impotent. Before treatment.

Fig. 116.—Same case as Fig. 115 after eight treatments.

Fig. 117.—Verumontanitis with fissure. Symptom: marked frequency of urination.

Fig. 118.—Ulcerative verumontanitis. Impotence of two months' duration. No gonorrheal history.

chronic alcoholism, such a picture may be seen in the posterior urethra.

The other conditions that will produce pathologic changes in the prostatic urethra are, first of all, posterior gonorrheal urethritis of long standing, especially in neglected or maltreated cases. Next in importance ranks colon bacillus infection. This organism may find its way into the urethra, either by coitus or by direct extension from the constipated lower bowel. Sexually acquired, the condition is often wrongly diagnosed. If not properly managed the inflammation frequently extends to the posterior urethra and produces severe changes.

Sexual Excesses and Abuses.—The vicious habit of indulging in coitus interruptus and frequent excitement without gratification are factors that will cause an enlargement of the verumontanum. Sexual excitation, so often the probable concomitant of a prolonged betrothal, is at the basis of many cases of verumontanitis, the results of which may not be noted until after marriage.

Treatment.—In discussing the treatment of impotence it is well to adhere to the classification adopted for the etiology. The first consideration, therefore, is the cases of psychic impotence.

It will frequently require the most unlimited amount of patience to handle these cases. The first point in attaining a cure is to obtain the absolute confidence of the patient. He should not be laughed at when he relates his story, which often contains humorous touches; give him your sympathy. Assure him that there is something the matter with him, but that you can cure him, or at least improve his condition. In all probability he has been through the hands of a number of medical men before he has reached you; probably the charlatan, faith healer, and Christian Scientist have also had their fling at him. Above all, gain his confidence and make sure that there is no real, underlying pathologic condition. In the absence of any organic lesion the question is one of instituting a régime of good hygiene, regular habits, and strict sexual abstinence, both mental and physical. I have always found it of value to urge some form of athletic exercise, swimming, gymnasium work, tennis, etc.; a simple tonic, attention to the bowels, and occasionally the passage of a sound and light prostatic massage. The latter procedures are employed more for their psychic effect than in the hope of any actual therapeutic benefit. It will be of value to make out a detailed schedule, giving the number of hours necessary for sleep, the diet, amount of exercise, etc. Remember these patients are suffering from a distinct form of neurasthenia and should be advised even in minor details. Persistence will in the end produce good results.

If there is distinct atrophy of one or both testes and no associated lesion the outlook is bad. I know of no treatment that will improve sexual power under these circumstances. The electric current can do no harm, but rarely does any good.

In inflammatory conditions of the urethra the individual infection is to be combated, and if subsequently there remains an infiltration of the prostatic urethra this is to be met by the method to be described presently. For staphylococcic infection the writer has found oxycyanid of mercury of great value, used in irrigations and instillations in solution of 1 : 10,000, increasing to 1 : 5000. In colon bacillus infection the solution of aluminum acetate (National Formulary), 0.5 to 2 per cent., should be used.

Fortunately, as before stated, by far the greater number of cases of premature impotence are caused by chronic inflammation of the verumontanum. I say fortunately, because the results of proper treatment are most gratifying, and within the safe age limit one may without fear give a favorable prognosis. The first point is removal of the cause, as given under etiology. Careful regulation of the bowels is of prime importance. Accumulations of hard feces in the rectum increase the state of congestion in the prostatic region. A non-acid diet is probably of value, especially when there is burning during micturition. In addition, bicarbonate of sodium in dram doses twice daily is an advisable adjunct to the régime.

If there is any appreciable congestion of the prostate or sensitiveness of the seminal vesicles, ichthyol and belladonna rectal suppositories, together with a very hot sitz-bath once or twice a day will give good results.

The all-important measure is the local treatment of the verumontanum. Through the endoscope applications of nitrate of silver are made, beginning with 10 per cent. and slowly increasing up to the pure caustic. Cauterizations are made at intervals varying from five to ten days, depending upon the severity of the reaction after treatment. Occasionally quite a profuse hemorrhage will occur if many granulations are present. This may be controlled by making a topical application of adrenalin. During the course of treatment attempts at coitus should be strongly interdicted. The treatment should be continued until all evidences of inflammation of the verumontanum are gone and no bleeding occurs when the endoscope is introduced. About ten to twelve cauterizations are required before cure is obtained. Before a patient is dismissed he should be warned that indulgence in any of the abuses which were the cause of his impotence will surely bring on a recurrence which will be much more difficult to relieve.

CHAPTER XIII

VERUMONTANITIS AND UTRICULITIS

In addition to or regardless of disturbances of the sexual equilibrium, inflammation of the veru and infection of the utricle may produce one or more of the following symptoms:

1. Frequency of urination.
2. Dysuria.
3. Urethral distress.
4. Urethral discharge.
5. Terminal hematuria.
6. Painful orgasm.
7. Orgasm followed by urethral hemorrhage.

The frequency of urination may be very marked and, as a rule, is experienced only during the waking hours. It may be so annoying as to totally incapacitate the individual for work. The desire to void may be felt just as soon as a few drops of urine accumulate in the bladder, or a few cubic centimeters may collect before there is an impulse to urinate.

The frequency may or may not be associated with pain and burning, depending upon the degree and extent of inflammation. The pain is never as severe as that experienced from acute urethritis. It is of a pricking nature and is felt only at the beginning of micturition.

Without the presence of either frequency or pain, urethral distress or discomfort may be experienced. This sensation is not accentuated during the urinary act, and may be felt more distinctly at the anterior portion of the urethra. Again, it is referred only to the region of the penoscrotal portion, which may be tender upon deep palpation.

These cases are usually treated for chronic prostatitis or seminal vesiculitis without any result.

A persistent urethral discharge, either as a sequel to or independent of a Neisserian infection may come from the utricle. As a rule, when of utricular origin the discharge does not show the presence of the gonococcus Either one of the organisms mentioned under non-gonorrheal urethritis (Chapter VIII) is demonstrable or no bacteria whatever can be found in the direct "smear."

Careful differential diagnosis is essential in order not to confuse this condition with prostatoseminal vesiculitis. Utriculitis may, of course, be present in conjunction with these pathologic processes, but the present consideration deals with utriculitis independent of any associated pathology.

Terminal hematura due to profuse granulations upon the veru is very common. It is necessary to differentiate this form of hematuria from that due to urethral stricture and trigonitis. In the former instance usually the amount of blood is small in proportion to that due to the stricture and bladder pathology, and it is not associated with variations in the caliber of the stream or the terminal pain of cystitis.

Painful orgasm is always due to one of three conditions: seminal vesiculitis, stricture of the ejaculatory duct, or verumontanitis. The differential diagnosis may at times be very difficult, particularly if the ejaculatory ducts are involved. Only the expert urethroscopist will succeed in introducing the filiform sound into the duct, and then by no means very often.

Orgasm followed by hemorrhage is indicative of granulations upon the veru or severe acute spermatocystitis. The latter condition is usually so pronounced that the libido does not manifest itself as a rule; consequently, the differential diagnosis is simple, especially so if endoscopic and intrarectal examinations are made.

Treatment.—The management of all these symptoms comes under one heading—namely, cauterization of verumontanum and injection of the utricle by means of the Geraghty syringe.

The topical applications are made with silver nitrate, either in gradually increasing strength or with the pure stick. The author has had no experience with either the galvanocautery or the electric spark, but sees no reason why in competent hands this therapy should not produce beneficial results.

Injection of the utricle is made with silver nitrate, 1 to 5 per cent. Not more than 0.5 c.c. should be used.

These treatments can be repeated every five to ten days, according to tolerance. As an adjunct to the local treatment ichthyol rectal suppositories, hot sitz-baths, and avoidance of sexual excitation will prove beneficial.

CHAPTER XIV

STERILITY

The consideration of this subject in the following pages deals only with the male sex. There must, however, be some latitude of discussion permitted in dealing with the statistics gathered from the various investigators.

In marriage the many authors consulted give as a fair average in whom there has been no issue at all, 10 per cent. On analysis this varies from 5 to 23 per cent., according to social and physical conditions.

Goehlerdt, of Vienna, states that in the Wittlesbacher dynasty, of 177 marriages, 23.7 per cent. were sterile; in the present reigning family of Germany in 600 marriages, 20.5 per cent. Intermarriage or consanguinity is mentioned as a probable factor in bringing up the percentage. However, venereal diseases, especially lues, should also be here included.

Chevin, of Paris, places sterile marriages in France at 20 per cent. Duncan, of Edinburgh, in 4447 marriages found 16 per cent. without issue. Simpson, several years later, gives 8.5 per cent. in 1252 marriages. Prochownik, a Bohemian, finds 9 per cent. in 2500 investigated marriages.

The Circulation of the Spermatozoa (Fig. 119).—Spermatogenesis, which occurs within the seminiferous tubules (Fig. 120), is a complicated process, description of which belongs more to the text-book on biology than to the pages of this work.

For our purposes here, we begin with the completed spermatozoön as it starts on its long journey through the many convolutions of the tubules to the hilum of the testes into the rete; then into the vasæ efferens and finally into the epididymis.

The vas deferens is now entered and the motility of the spermatozoön is assisted by the cilia of the columnar epithelium and peristaltic contractions of the vas. Reaching the ampulla, they pass into the seminal vesicles, the musculomembranous reservoir, where they are stored to await ejaculation. Within the vesicles the first allotment of albuminous material is supplied to form the combined elements which constitute the semen. This material which is elaborated at orgasm is further supplied by the prostate and Cowper's glands.

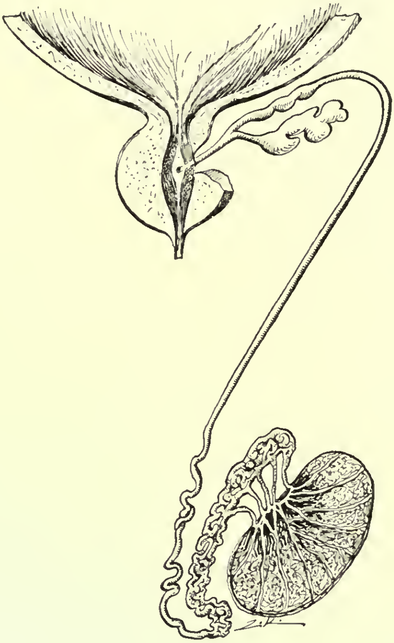

Fig. 119.—Scheme showing the circulation of the spermatozoa.

The ejaculatory ducts, which empty into the prostatic urethra lateral to the verumontanum, are formed by the union of the ducts from the seminal vesicles and the vas deferens. They carry the stored sperm in the vesicles and the sperm coming up directly from the testes into the urethra with each ejaculation.

The secretions from the vesicles, prostate, and Cowper's glands, while essential to the health of the spermatozoa, are not necessary for its motility, as has long been taught. This is proved by the motility of the sperm when drawn up from the testes or epididymi through the needle and syringe. The etiologic pathology of sterility can be classified as follows:

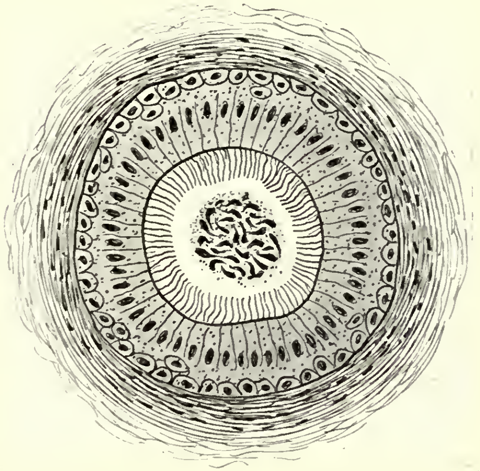

Fig. 120.—Cross-section of a seminiferous tubule showing spermatozoa in the center.

Azoöspermia.

1. Failure of spermatogenesis.
    - (*a*) Congenital.
    - (*b*) Acquired.
        - Cerebral.
        - Constitutional.
        - Testicular.
2. Obstruction to circulation of spermatozoa.

Imperfections of the Spermatozoa.

1. Genetic.
2. Inflammatory.

Failure in the process of spermatogenesis is unquestionably not infrequently congenital. This is proved by the total absence of spermatozoa in the testicular secretion drawn directly from the testes or epididymi. It is, of course, due either to absence of the spermatogenic cells or their underdevelopment. There is no record of such a testicle ever having been examined histologically, an unfortunate missing link which might join our theory to something practical. Bilateral, undescended testes, if allowed to persist after puberty, are very likely to become atrophied, with resulting sterility.

The acquired failure of spermatogenesis of cerebral origin may be due to prolonged excitation or destruction of the anterior lobe of the pituitary gland. The former of these two conditions was first described by Ceni, and is rather obscure in its mechanism. It is probably a direct selective inhibitory process, which in truth does not in the least explain why this result should follow in certain instances and not in others.

Any constitutional disturbance, either metabolic or hemic, whereby a condition of general debility exists, will reduce the vitality of the reproductive elements. This may be expected to ensue, inasmuch as any highly specialized physiologic process is always upset when there is any debilitating disease in the body.

There are many pathologic processes within the testes that may destroy or damage the seminiferous tubules. In accord with the necrobiotic axiom, the more highly specialized cells are the first to be attacked and destroyed when a parenchymatous organ undergoes pathologic change.

The external stimuli which will bring about destruction of these tubules are prolonged exposure to the *x*-ray and trauma. The former condition is usually seen in radiographers. Their semen is wholly devoid of spermatozoa. Traumatic orchitis, when bilateral and severe, will eventually lead to atrophy of the testes, and the spermatozoa either disappear entirely or are greatly reduced in number and vitality. The orchitis complicating specific parotitis and typhoid and scarlet fevers often result in atrophy and subsequent azoöspermia.

It is unusual for an infectious process to invade both testes simultaneously, and so long as one of the organs remains healthy the procreative power is maintained.

Obstruction to circulation of the spermatozoa, to produce sterility, must, of necessity, be bilateral. Such a state is not of common occurrence. When it does occur the most frequent cause is gonorrheal epididymitis. General statistics claim that 60 per cent. of the cases of gonorrheal invasion of the epididymi result in patent vasæ. In this connection, taking into account the infrequency of a bilateral epididymitis, the number of cases of sterility from such a condition is exceedingly small.

The only other conditions whereby the vasæ may be obstructed are inclusion in the scars of herniotomies and the high operation for varicocele. Whereas the number of such occurrences is relatively rare, they probably are more frequent than is supposed.

Another obstacle to the exit of spermatozoa during orgasm may exist at the orifices of the ejaculatory ducts. This may be due to stricture of the ducts or pressure of an inflamed prostate or seminal vesicles, or both.

Tight stricture of the membranous or prostatic urethra may divert the ejaculation of the semen into the bladder. This condition is not so rare and is easy to diagnose and correct.

Imperfections in spermatozoa may be of genetic or inflammatory origin. If due to the latter condition other clinical and physical signs will be manifest. According to Lespinasse, to whom all credit must be given for the most extensive study of the spermatozoa, the following types are described:

"1. The heads may be about twice as large as normal and may take the pink of the Jenner stain. Frequently the neck and tail stain blue. This picture is frequently given by spermatozoa from the vagina one or two hours after intercourse.

"2. There may be a spermatozoön with a U-shaped tail and normal head and always motionless.

"3. We have the wry-neck spermatozoa, usually with considerable motion.

"4. There may be a large head stained blue with a very thick neck-piece and a short tail with slight motion."

Motility of the Spermatozoa.—In examining a specimen of semen to ascertain the motility of the spermatozoa, there are several factors that should be considered:

1. The time that has elapsed since the semen was ejaculated.
2. The conditions under which it has been kept.
3. The viscosity of the semen.

To continue again with the study of Lespinasse:

"In a normal semen one or two hours old and kept either at body temperature or around 60 or 70 degrees, practically every spermatozoön should be motile. Most of them will be progressing, some few will be simply moving *in situ* or making little progress. If the semen is markedly clotted the progressive motion will be much slower, but the attempt at progression and the movement *in situ* will be very active. As time goes on and the clot thins, the progressive motion will become more and more active, so that a spermatozoön that takes ten seconds to cross the one-sixth field will cross it in six to eight seconds. From now on one will notice more and more spermatozoa that have ceased to progress, showing a backward and forward movement only, and even this motion gradually becomes less and less and finally ceases.

"Coincidentally with these changes the general rate of the movement lessens and we have in the picture many motionless spermatozoa, many moving *in situ*, and a few actively progressing. In five to ten hours in normal cases, depending upon external conditions, all movement ceases. In the specimen which I have considered to be weak spermatozoa we find many absolutely motionless, and at the end of from one to two hours some few only slightly moving, and a few that will have various grades of motion, up to approximately the normal. In other words, the motility of the spermatozoa grades from normal to those that show absolutely no motion at all. The weakest case I have encountered with any movement at all was spermatozoa which were absolutely motionless at the end of one hour after intercourse; at the end of one-half hour there was slight motion, and at the end of three-quarters of an hour there was very slight motion. The semen in this case was examined many times and these conditions were always observed. Careful account of the time of ejaculation was taken in each instance, and the spermatozoa transported in an ideal manner.

"Under proper thermal conditions normal spermatozoa will live about six hours."

In the routine examination of spermatozoa, from sterility cases, kept under conditions described above, it is surprising to find the number of cases in which the spermatozoa live but an hour or two; hence we must conclude that these spermatozoa are deficient in some way and consequently are the cause of the sterility. Morphologically, the spermatozoa which live but a short time, comparatively, show a large percentage of deformity, particularly the wry-neck type.

The diagnosis of sterility in the male depends upon examination of the semen. It should be transported to the examiner in a condom which is suspended in a bottle of warm water, or, better still, in a Dewar vacuum tube made for this purpose. It should be examined as soon after ejaculation as possible. Again quoting Lespinasse, the physical properties of the semen are noted, paying particular attention to the consistency. "A normal semen coagulates as soon as discharged and then gradually becomes liquid again, this process taking from ten minutes to hours, depending on the various factors. Exposure to air seems to hasten the liquefaction of the coagulum. Most specimens in cases of azoöspermia have little if any coagulability and are quite thin."

If spermatozoa are present and the specimen is less than two hours old, they should show considerable motion. If motility is absent we have another factor in the sterility. Next the morphology of the semen should be carefully studied. If we find spermatozoa present, they should be examined as to their motility and morphology. "A specimen that shows a large number of deformed spermatozoa is undoubtedly a sterile specimen. The deformities of the spermatozoa are usually much enlarged heads, double heads, and double tails on an enlarged head. These spermatozoa are rarely seen to move. On the other hand, we may have a very small head with a short tail or a small head with a short tail that is curved into a U shape."

In the absence of spermatozoa from the semen the site of obstruction is to be determined. The history in this instance is of value. To eliminate the ejaculatory ducts as the offenders the Belfield operation should be done before proceeding to any plastic work upon the vasæ.

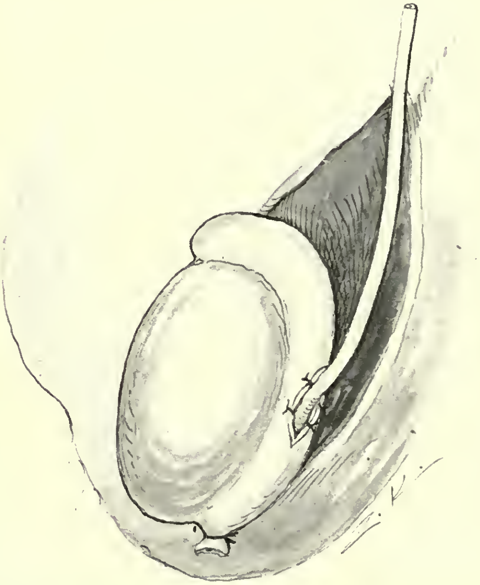

Fig. 121.—Implantation of severed end of the vas into the epididymis.

Treatment.—For correction of imperfect spermatogenesis a general improvement of the metabolism of the body is the first essential. Lespinasse recommends internal administration of the extract of the anterior lobe of the pituitary gland. If the fault lies in inflammatory processes of the genital tract, especially posterior urethritis, verumontanitis, prostatitis, or seminal vesiculitis, each condition must be met as described in previous chapters.

Thus far surgery upon the vas has been very unsatisfactory. In the hands of the most experienced failures are as high as 75 per cent.

Various methods of dealing with the obstruction have been suggested. Hagner, among the first to do this work, implants the cut end of the vas into a newly made pocket of the epididymis (Fig. 121). McKenna has improved the technic of Martin and others by short-circuiting the vas or making a lateral anastomosis of the vas into the globus minor of the epididymis (Fig. 122).

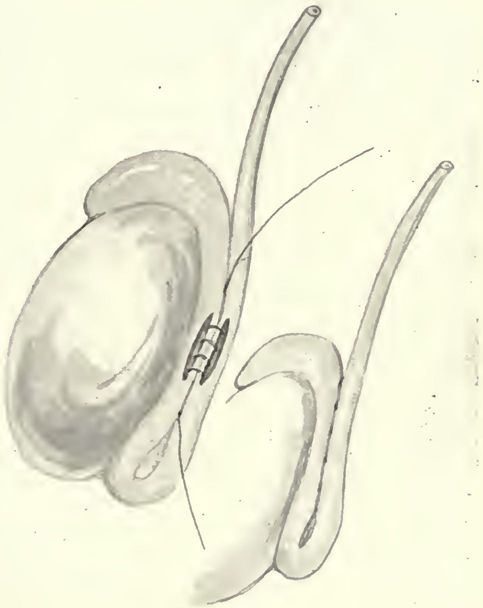

Fig. 122.—Short-circuiting of the vas to the epididymis.

End-to-end anastomosis of the vas (Fig. 123) has also been done where the stricture has been definitely located in the more pendulous portion of the duct. The technic can best be followed by referring to the accompanying drawings. Lespinasse's sack operation drains the sperm into a gutta-percha sack fixed at the proximal end of the vas. The collected spermatozoa are used for artificial insemination.

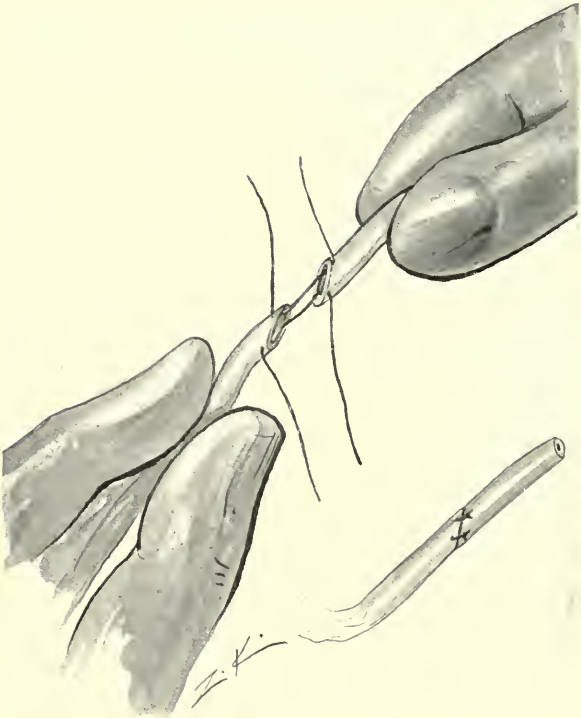

Fig. 123.—End-to-end anastomosis of the vas.

It is of importance to keep the patient in bed for ten days. Coitus should be forbidden for three to four weeks after the operation.

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